SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LVIII.—No. 21. [NEW SERIES.] NEW YORK, MAY 26, 1888. [$3.00 per Year.

THE ITALIA.

This week we illustrate this celebrated Italian armorclad, a vessel which, says *Engineering*, has aroused more interest in naval circles than any other war ship since the French La Gloire was the means of introducing armor plating as a method of defense for first-class ocean-going war vessels.

The Italia and her sister ship the Lepanto were commenced about ten years ago. In design they were an immense step on anything that had preceded them. One cannot help admiring the courage of the Italian naval authorities in laying down these two vast and costly ships, comprising so much in their design that was open to criticism and necessarily involving features of doubtful advantage. This reproach, however, may be brought against all modern war ships, for the absolute data we have to go upon in the present day is of so meager a character that no one can pronounce with any degree of certainty what would be the practical fighting value of any particular class of design. Until the world sees a great naval war every one is entitled to an opinion, and hence the vast gulf that divides the doctrines of our most renowned professors.

The Italia was built at Castellamare, on the Bay of Naples, and the Lepanto at Leghorn. It will be remembered that in 1877 the Italian parliament sanctioned what may truly be described as a spirited naval policy. It was decided to build sixteen battle ships of the first class, ten of the second class, and twenty cruisers. Italy had then afloat the powerful armorclad Duilio, and her sister ship, the Dandolo, was being pushed forward at Spezia. These are iron ships, each 10,400 tons, of the Inflexible type, having turrets placed in a similar position to those of the latter vessel, while the ends depend on subdivision and on an armored deck for protection from fatal damage. The Italian vessels were commenced before the Inflexible, and, therefore, cannot in any way be said to have been copies of the English ship. In them external armor is placed on a citadel 107 feet in length, and descending for about 6 feet below the water line. This central distance of 107 feet is the only part of the ship's side which is protected by vertical exterior armor. A design based on these lines soon attracted hostile criticisms from Sir Edward Reed, who, during the construction of the vessels, expressed his opinion that they were exposed "beyond all doubt and question" to speedy destruction, and that the Italians "were pursuing a totally wrong course likely to result in disaster."

In spite of the strictures of our ex-chief constructor, the Italians not only followed up their plan of design undaunted, refusing to put outside armor on the ends of their ships, but actually had the temerity to abandon outside protection altogether—a step which must have fairly taken their critic's breath away. The result is the Italia and the wonderful ships of the same class which have followed her.

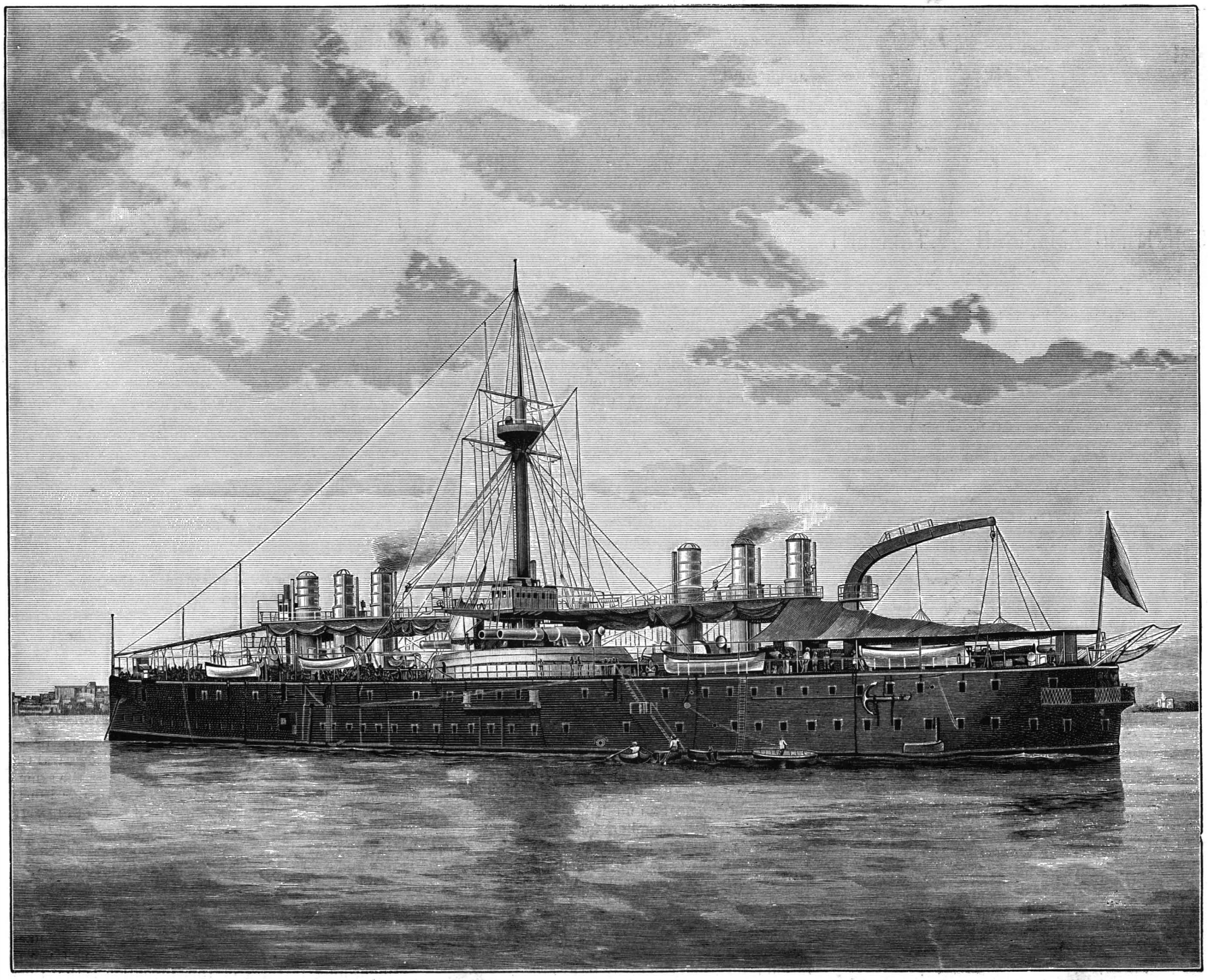
The following are some of the particulars of design of the Italia and Lepanto:

	ft.	in.
Length between perpendiculars	400	6
Breadth of beam at water line	73	9
Breadth of beam at upper deck	65	6
Draught of water forward	26	6
Draught of water aft	30	6
Draught of water mean	28	0
Area of immersed midship section	1,770 sq. ft.	
Displacement at load draught	13,480 tons.	
	ft.	in.
Length of armored tower on fore and aft line	88	6
Breadth of armored tower across ship (extreme)	72	6
Length of armored tower *per se*	96	0
Breadth of armored tower	52	9
Distance of stem from armored tower	170	0
Thickness of side of tower, including armor	3	3
Thickness of armor on tower	0	21
Thickness of armor on breastwork	0	18
Height of center of heavy guns above water line	32	8
Height of top of tower above water line	30	0
Height of upper deck above water line, forward	25	0
Height of upper deck above water line, aft	23	0
Height of upper deck above water line, amidships	22	6
Height between upper deck aud battery deck	7	9
Height between battery and second deck	7	9
Height between second and armored deck	7	6
Depth lower deck below water line, amidships, sides	5	6
Depth of hold under lower deck	21	0
Extension of ram beyond forward perpendicular	6	4
Distance of point of ram below water line	8	6

Machinery.

Number of engines	4 sets	
Number of cylinders	12	
Number of propellers	2	
Diameter of propellers	19	6
Number of boilers	26	
Number of furnaces (three to each boiler)	78	
Total grate area	1,521 sq. ft.	
Length of ship, fore and aft, occupied by engines, coal, and boilers	ft. 250	in. 0

(*Continued on page* 325.)



THE ITALIAN IRONCLAD ITALIA.

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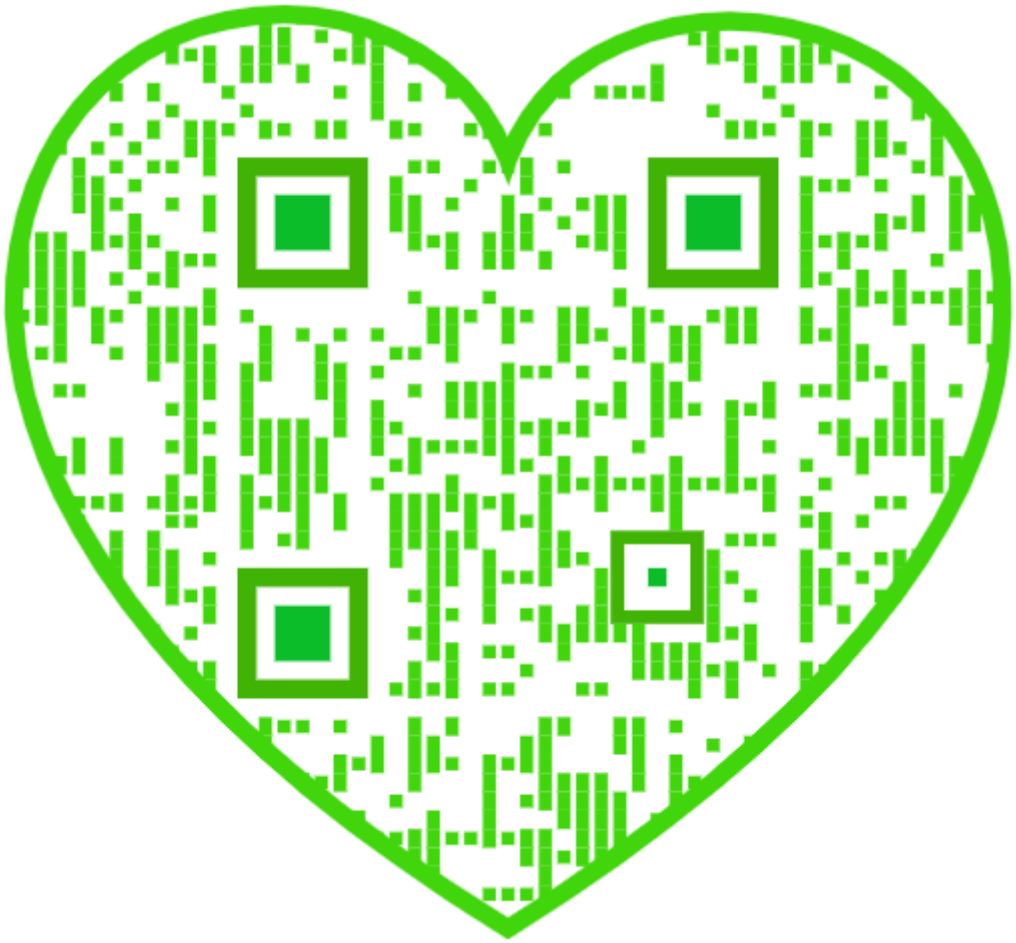

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S. or Canada.....$3 00
One copy, six months, for the U. S. or Canada..... 1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00
Remit by postal or express money order.

Australia and New Zealand.—Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit £1 in current Colonial bank notes. Address

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S. and Canada. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

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NEW YORK, SATURDAY, MAY 26, 1888.

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IMPORTANT DECISION IN THE EDISON ELECTRIC LIGHT SUITS.

In May, 1885, the Edison Electric Light Co. brought a number of suits for infringement of its patents against various electric light companies and others using incandescent plants. These suits were about eighty in number, and thirty of them were contested by the United States Electric Light Co., of New York.

Last April the latter cases were argued before Judge Wallace of the United States Circuit Court, and he has just rendered a decision against the Edison company.

From a broader point of view than that of the magnitude of the interests directly involved, the decision is of importance. It is based on the interpretation of Section 4,887 of the United States patent laws. This is the well known clause limiting the duration of an American patent to the term of the shortest foreign patent which may have been granted before it was granted in this country. The ground of the defense was that a patent for the same invention had been taken out in the Austro-Hungarian empire for one year, and by proper process was extended to two years, and expired on July 21, 1883. This date was prior to the commencement of the suit. The American patent bore an intermediate date of granting, August 22, 1882.

The decision covered the following points. The suit was brought subsequent to July 21, 1883. The court held that it could have no jurisdiction if the American patent expired on that day along with the Austro-Hungarian patent because suit was brought nearly two years later. The defendants' plea as to lack of jurisdiction was therefore allowed. The complainants had claimed, as application for an American patent was made before the inventor applied abroad, that section 4,887 should not apply. This Judge Wallace disallowed.

The injustice done by this much debated clause of our patent law is very evident in the present instance. Mr. Edison appears as the uncontested inventor of an immensely valuable system. Possibly by neglect a comparatively unimportant foreign patent is allowed to lapse. At once his invention is declared public property and at the mercy of any one who save for a technicality would be an infringer. Many lawyers have contended for the abolition *in toto* of this statutory restriction. In Edison's case the hardship caused by its application is emphasized by the fact that he had applied for his American patent first. The statute, however, is based on granting, not on application. A delay in action by the examiner, clerical inattention, or some other trivial cause might bring about the same result for any one. If so radical a measure as the abolition of the foreign limitation clause seems obnoxious, some change should be made. The time when the American patent is applied for should at least be made the critical point; it should not be the day of granting the patent. The date of application is fixed by the inventor's own action. The date of granting may depend on many other causes.

Much might be done by appropriate legislation in placing the relations of American and foreign patents on a better basis. The Industrial Union has had little effect. It is not in international action that the remedy is to be found. As the law now stands, the United States gives far greater privileges to foreigners than she receives from other nations. In England, for instance, a patent costs nearly twenty times as much as an American one, yet we give a foreign inventor a patent at our nominal rate. The United States should charge the foreigner as much as his government charges our citizens. A different rate for citizens of other countries could be established.

The equitable view of patents regards them as a franchise granted for a valuable consideration. The consideration is the publishing of the invention, and the price paid for such publication is the seventeen years' monopoly. In every sense of the term, our citizens are entitled to this privilege. It operates to stimulate invention and manufacturing industries, and has placed America at the head in the race for material progress. But it is not at all so clear that a foreign inventor should be allowed any patent. If his invention is published abroad by patenting, then the disclosure is made. The patent right is an artificial and statutory one, and can be equitably withheld. As far as the encouragement of manufacturing industries in America is concerned, patents to foreigners do little or nothing for it. A point well worth consideration is whether United States patents to foreign inventors should not be abolished.

In the particular case under consideration, a great hardship appears to have been done. A purely technical defense to allegations of infringement has carried the day against an undisputed inventor. It is evident that there is room here for special legislation. It is but a few months ago that attention was called to the renewal and extension by Congress of an expired patent. The Edison patents seem entitled to the same favor. They are declared as expired on a technical point. Their expiration for all that appears may have been due to the delays of the Patent Office officials. Their merit and originality are not impugned. Reparation is due, and can easily be awarded.

At the same time, without any appeal to an international tribunal or regulation, the obvious defects in that portion of our patent law relating to foreign patents and patentees might be brought into a better condition. International agreements inevitably lead to complications. America in the regulation of her industries and commerce should be as free as possible from foreign limitations. In these respects above all she should be independent. The action of the Patent Office and of our circuit courts, where patents are in issue, should not be based upon transactions with foreign officials and bureaus. In Congressional action only can a remedy be found.

THE UNDERGROUND PIPES OF LARGE CITIES.

The increasing requirements of modern civilization are well illustrated by the extent and variety of underground pipe systems now employed in large cities. Thus there are in actual operation:

1. Pipes for conveying and delivering illuminating gas.
2. Pipes for conveying and delivering fuel gas.
3. Pipes for conveying and delivering drinking water, and for fire purposes.
4. Pipes for conveying salt water for street sprinkling and for fire purposes.
5. Pipes for draining, and carrying off sewage and surface water.
6. Pipes for delivering hot water under high pressure, for heating purposes and power.
7. Pipes for delivering cold water under high pressure, for power.
8. Pipes for delivering live steam under pressure, for heating purposes and power.
9. Pipes for delivering compressed air, for purposes of power and ventilation.
10. Pipes for producing power where required, by vacuum or suction, and for ventilation.
11. Pipes for conveying letters and packages, by compressed air and by vacuum.
12. Pipes for regulating clocks, by compressed air.
13. Pipes for conveying mineral oils.
14. Pipes for electrical wires for electric lighting, electric railways, telephones, and telegraphy.
15. Pipes for power ropes for driving machinery, moving street railway cars, etc.

THE CARNEGIE SAVINGS BANK.

The firm of Carnegie, Phipps & Co., of Pittsburg, issued during the present month a circular to their employes, offering to take deposits from them not to exceed $2,000 for each individual, and to allow six per cent interest on the money. This offer was coupled with a statement that the firm, as hitherto, would continue to lend money at bond and mortgage to intending builders of homes. At the end of the circular the men were exhorted to adopt the practice of saving and investing some part of their earnings as a provision against old age. This offer represents what may be justly termed an advanced form of profit sharing. The rate of interest and the conditions are such that there is little probability of the banking account giving any profit to the firm. Too much praise cannot be awarded to the members of the partnership for showing so great and so judiciously conceived an interest in the affairs of their workmen.

ELECTRIC LIGHT FIRES.

The frequency of conflagration caused by electric light wires induced the Electric Club of Philadelphia to inquire into the means of preventing them. At a recent meeting, the report of a committee of four months' standing, under the chairmanship of Mr. H. B. Cutter, was presented. The various automatic cut-outs proposed by different inventors were considered, some utilizing the heating of a wire, some the action of a spring pulling against an armature of a magnet. The old arrangement of a fusible alloy cut-off was pronounced objectionable on account of the interruption produced when it melted, but this was obviated by an arrangement for throwing other fusible pieces into the circuit one after the other. Thus a momentary increase of current would only cause a momentary stoppage. It was evident that there is a good field for inventors here, in devising an efficient safeguard against too strong currents that may accidentally be thrown upon a wire unable to carry them without heating.

PROGRESS OF THE PHONOGRAPH.

We give elsewhere an account of the trial of the new Edison phonograph at the rooms of the Electrical Club in this city. The results are substantially the same as those described by us in connection with our illustrations of the new instrument, given in the SCIENTIFIC AMERICAN of December 31, 1887. A modified form of the phonograph, invented by Prof. Alexander Graham Bell and associates, is said to give excellent results.

Still another form has been perfected by Mr. Emile Berliner, of Washington, D. C., who recently read a paper on the subject before the Franklin Institute, Philadelphia, and also exhibited his new instrument, which he styles the "gramophone." One of the distinguishing features of this invention is that the indentations of the transmitting diaphragm are made

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upon a flat plate instead of a cylinder, as in the Edison and Bell devices.

Mr. Berliner, in his paper, reviewed the history of the telephone; the phonautograph, invented by Leon Scott and patented in France in 1857; the invention of Charles Cross, described in a sealed communication to the French Academy of Sciences, April 30, 1877, but which was not read until after Edison produced his phonograph. To Cross Mr. Berliner gives the credit of having first suggested the idea of a feasible plan for mechanically reproducing speech. He also referred to the graphophone, invented as an improvement on the phonograph, and the lately perfected phonograph of Edison, both of which use wax for receiving the impression instead of the tinfoil first used. In the gramophone a polished metal plate, generally zinc, is given a coating of etching ground, composed of beeswax digested in cold gasoline or benzine, which is extremely sensitive to the touch, but protects the plate from the influence of acids.

As the plate is revolved by clockwork, the stylus of the recording apparatus, which has a lateral instead of a vertical motion, as in the earlier inventions, cuts a waved line through the etching ground. The plate is etched with a solution of chromic acid, the groove being deepened by "rebiting," and placed in the reproducing machine. The latter is constructed on the same principles as the recorder, but of smaller dimensions and with more rigid mountings, the stylus being tipped with iridium to prevent its abrasion by continuous friction, and reproduces the sounds in much the same manner as the phonograph. In the demonstration Mr. William G. Fischer sang into the receiver parts of "Auld Lang Syne" and "When I Can Read My Title Clear," and Mr. Berliner recited into it a verse of "Mary Had a Little Lamb." When the plate was etched and placed in the reproducing machine, the sounds were reproduced with considerable fidelity to the originals.

MILITARY NOTES.

The recent assertion of General Wolseley that, if 100,000 hostile soldiers were landed on the British Isles, they could not be successfully opposed, because of the meagerness of the present military establishment, had the effect of waking up the old fogies of the war office, and setting Britain's legislators to thinking. The Premier made a very neat point on the General, who is said to be considerable of a martinet, by demanding to know how he could expect silent obedience from his subalterns, while himself publicly criticising his superiors. But he couldn't disprove the General's assertion that the country is wholly unprepared for war, save on paper, and so the breach in discipline and etiquette committed by the soldier was passed without further reproof, a large sum of money voted for the army, and steps taken toward reorganization on an effective basis.

General Wolseley seems to have thought that the urgency of the case warranted even so grave a breach of discipline, and the approving action of the commander in chief of the forces, the Duke of Cambridge, would imply that he did not overestimate the gravity of the situation. Though nominally only Adjutant-General, it should be remembered that Wolseley, in all likelihood, would be called to command should trouble come, for he has been called, perhaps not altogether facetiously, "England's only general;" and hence it is not at all strange that he should prefer to resign, indeed, he offered to do so, rather than shut his eyes any longer to what he regarded as fatal errors in the management of the army.

British troops have done great things in their day, and in the face of overpowering numbers, too, as when Wellington, with 25,000 men, some of them Spaniards and Portuguese and of no value, turned upon his 70,000 pursuers under Ney, at Busaco, in the Peninsular war, and beat them; and again when, in the Crimea, Col. Scarlet with a single brigade of cavalry, the "Heavy" brigade, charged successfully 10,000 Russian horse. These are but specimens of what the British soldier can do. History abounds with similar instances. But in those days, there is reason to believe, brawn and courage were of more value than now, when the direful machine gun and its cousin, the magazine rifle, have come into general use. The soldier whose nerves cannot stand the approach of cold steel has heart enough for the work behind the machine gun battery, and may prove a very demon with a repeating rifle on a half mile range.

And so it is that the British drum-beat, though heard around the world, is too widely distributed to make a deafening noise, and even in the British Isles it is scarcely more than a clatter when compared with the drum-beat of the Continental armies.

One of the results of General Wolseley's alarm was to give a large contract to our countryman Hiram Maxim, the inventor of an automatic machine gun that may fairly be called one of the wonders of this age, and which has been described and illustrated in the SCIENTIFIC AMERICAN. In it the recoil of the piece when once fired is utilized to throw out the empty shells, ram home fresh charges, and, at the same time, keep a column of cool water moving about the barrels to prevent heating. Left standing upon its tripod by a retreating army, it will keep up a rapid and murderous fire upon the advancing pursuers to the last second of effectiveness, and, if properly handled, may be made to scatter its deadly bullets along the ranks of an enemy, like a storm of iron hail blowing in his face.

Maxim first attracted attention in this country shortly after Edison had found a means of subdividing the electric light. As will be remembered, Edison used carbon filaments of bristol cardboard in his vacuum lamps. There being no such thing as a true vacuum in nature, the lamp when it left the mercury pump still contained enough oxygen to insure the gradual disintegration of the carbon loop. Maxim constructed a lamp on similar principles and filled it with the vapor of gasoline, which, when the carbon had been worn away by combustion, deposited a like amount of the same material on the threatened part, thus keeping the carbon loop in repair. But it stained the glass of the lamp also, and was little used, but was nevertheless an original idea, as was also the making of carbon loops out of carbon cut from gas retorts.

There is great alarm in Central Europe at the continual movement of Russian troops toward the Austrian frontier. *L'Avenir Militaire* quotes the journals of this district to the effect that the 19th (Stawropol) division of the Russian army, long stationed in the northern part of the Caucasus, is on its way to the Austro-Russian frontier. Russian diplomatsinsist that the continual movements of large bodies of troops toward the Austrian frontier is in accordance with the Czar's desire to strengthen the western limits of the empire, and have no other signification, but military Europe seems to be agreed that it means preparation for a war that is inevitable, and for which the Czar and his advisers are diligently seeking a pretext.

PHOTOGRAPHIC NOTES.

A Continuous Magnesium Powder Light.—On page 200 of the March 31, 1888, issue of the SCIENTIFIC AMERICAN is shown in Fig. 1 a method of blowing magnesium powder into a flame of alcohol by means of a pneumatic bulb. Dr. H. G. Piffard recently exhibited an improved method by which a continuous current of compressed air or oxygen gas, regulated by suitable stop cocks, forced the magnesium powder very evenly and rapidly out of its reservoir into the alcohol flame, producing an enormous magnesium flame of high actinic power. The oxygen intermingling with the magnesium particles aided its rapid combustion. The flame can be kept up as long as the powder is supplied. An ordinary cylinder of compressed oxygen, such as is furnished for the lime light, was employed.

The Cellulograph.—This beautiful new style of photograph was lately exhibited before the New York Society of Amateur Photographers, and is made by Mr. C. Theo. Cain, of Owensboro, Ky. A positive is made on glass with collodio-chloride emulsion, toned in the usual way, and then transferred on to a sheet of white celluloid. The process is quite simple. The resulting picture looks very similar to the well known ivorytypes. The sheet of celluloid can be easily embossed, shaped, and moulded into beautiful designs. It makes a very novel and durable picture.

Lantern Slide Mats.—A simple but quick way to construct dies to cut out lantern slide mats is to take a clock spring, file one edge down and bend it around a block of the desired shape of the mat, having the filed edge inward. Suitable holes are punched in the steel spring, through which screws pass, to fasten it to the block. The spring projects about one-fourth of an inch above the surface of the block, and when put in place presents a sharp cutting edge. The block should be made of hard wood. The paper is folded in four thicknesses, placed on the die, and is cut out by tapping on a hard wood block with a hammer, the block, of course, resting on the paper.

Purple Tones on Wet Plates.—To obtain purple tones it is customary to tone the plate before fixing with a solution of bichloride of palladium; but we have found a way of producing a brilliant purple tone during development.

The following is the formula for the developer:

Water	4 ounces.
Acetic acid	20 minims.
Pyrogallol	¾ grain.

The developer acts somewhat slower than iron and acetic acid, yet it proceeds gradually and rapidly. It is quite important to get, as near as possible, the right exposure.

After fixing in a hypo. bath one to six, the plate will have a beautiful purple tint, which is generally admired in transparencies and lantern slides.

Exhibition of Photographs.—A very large exhibition of photographs was held in Boston, Mass., between May 7 and 12, comprising the work of three amateur photographic clubs and others. It is said to have numbered nearly 1,000 pictures. Over 6,000 persons visited the exhibition.

Action of Water upon Wool Fibers.

Pure and, before all things, soft water, that is, water which contains as little foreign admixtures as possible, is just as indispensable for a good finishing as it is for washing and dyeing. It imparts to the wool a soft feel, and maintains its natural luster without increasing it noticeably or changing it into a shiny water luster. A continued treatment of teaseled cloth with hard water is just as injurious as one with soft water is advantageous. Any one wishing to make the trial can easily satisfy himself of the truth of this statement by teaseling two pieces of cloth, equal in all respects, the one with well water, the other with distilled water. Rain water also is very well suited for imparting to the wool fiber a soft feel and an agreeable luster. In the good old time, the majority of smaller manufacturers immersed finer grade napped cloth in a vat of carefully collected rain water for several days after teaseling or after the first steam-lustering, and considered this method as one imparting an especially delicate feel and nice, deep luster.

This luxury, if we may be permitted to so call it, cannot be indulged in by the large manufacturer of our day. Still, the small manufacturer may, whenever he produces a specially handsome line of cloth, go to this little extra manipulation—*provided* that sufficient quantities of soft water are at his disposal. Long rivers generally contain the best and softest water, which is doubtless due to the fact that the water is exposed to the ameliorating influence of air and sun for a longer time. The water of creeks and mountain streams is generally hard. Finishers living in a large cloth manufacturing district in Germany, through which a river flows, aver that its water in spring is not as good as at other seasons, because at this season it receives large quantities of water from the surrounding mountains and other immediate sources. Some even go so far as to assert that they are able to recognize the goods finished with water of the spring season.

It is obvious that the influence of water at a high degree of temperature must be much more intense upon the wool fiber, and naturally obstinate wool may, by treatment with hot or boiling water, be made more sensitive and pliable. If, after the nap-teaseling out of full water, the cloth is loosely rolled upon rollers, and immersed for five or six hours in water of from 170° to 190° F., it will assume a very nice feel, and a good, smooth face, with a dull luster. The cloth, being withdrawn from the bath after the specified time, must be unwrapped at once, taken into the washing machine warm, and rinsed with cold water for from one-half to three-quarters of an hour. By this treatment with hot water the wool fiber is to a certain degree lixiviated. It voids a peculiar slimy substance, after the removal of which, by rinsing, the fiber becomes more pliable. By omitting this rinsing and permitting the slimy substance to coagulate again upon the fiber, the principal effect is lost.

Here, also, this rule may be applied: The softer the water the greater the effect; and it has been found that the good appearance of the cloth is increased by the age of the water in the reservoir, that is, the oftener it has been used. It is natural that the foreign ingredients will separate from the water the oftener it is heated. At any rate, the reservoir must occasionally be emptied and cleaned, on account of the constantly forming sediment. Pieces of cloth which have been prepared for teaseling in the customary manner also become much softer in such a water, which, as aforesaid, had been used repeatedly. They teasel much more quickly, and take a softer and fuller nap than those treated with fresh water.

Our remarks referring to the operations in which the influence of water upon wool is to be considered, are also applicable to the treatment with steam in the steam lustering, steaming, and making ready for the needle. As is well known, steam is nothing more than water in a very finely divided form, and united with heat. Here, also, we find the ameliorating influence of the water upon the wool fiber accomplishing the desired effects, largely increased by heat.—*Industrial Record.*

The Flour Product of a Week.

According to the *Northwestern Miller* of May 11, the Minneapolis mills made 168,600 barrels of flour that week, and shipped 163,665 barrels, of which 47,800 barrels went abroad. The market is unsettled and dull, with prices higher. The St. Louis mills made 63,750 barrels that week. The market is fairly firm, but rather dull. The two largest mills at Winona, Minn., are temporarily idle, owing to high water in the Mississippi. The Indiana State convention was held at Indianapolis, with a large attendance, and decided to join the national association. The millers of the west-central Illinois district met at Springfield recently and formed a strong district organization. Thirty leading firm were enrolled and signed an agreement to work in harmony.

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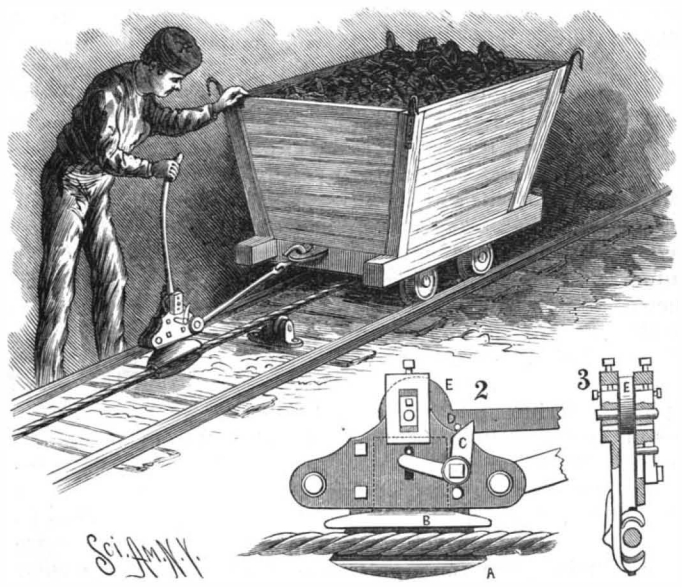
AN IMPROVED CABLE GRIP.

A device more especially designed for use as a cable grip in connection with the handling of miners' cars, and which is simple and effective, containing no springs, has been patented by Mr. William J. E. Carr, of Leavenworth, Kansas, and is illustrated herewith, Fig. 2 showing a side elevation and Fig. 3 a sectional



CARR'S CABLE GRIP.

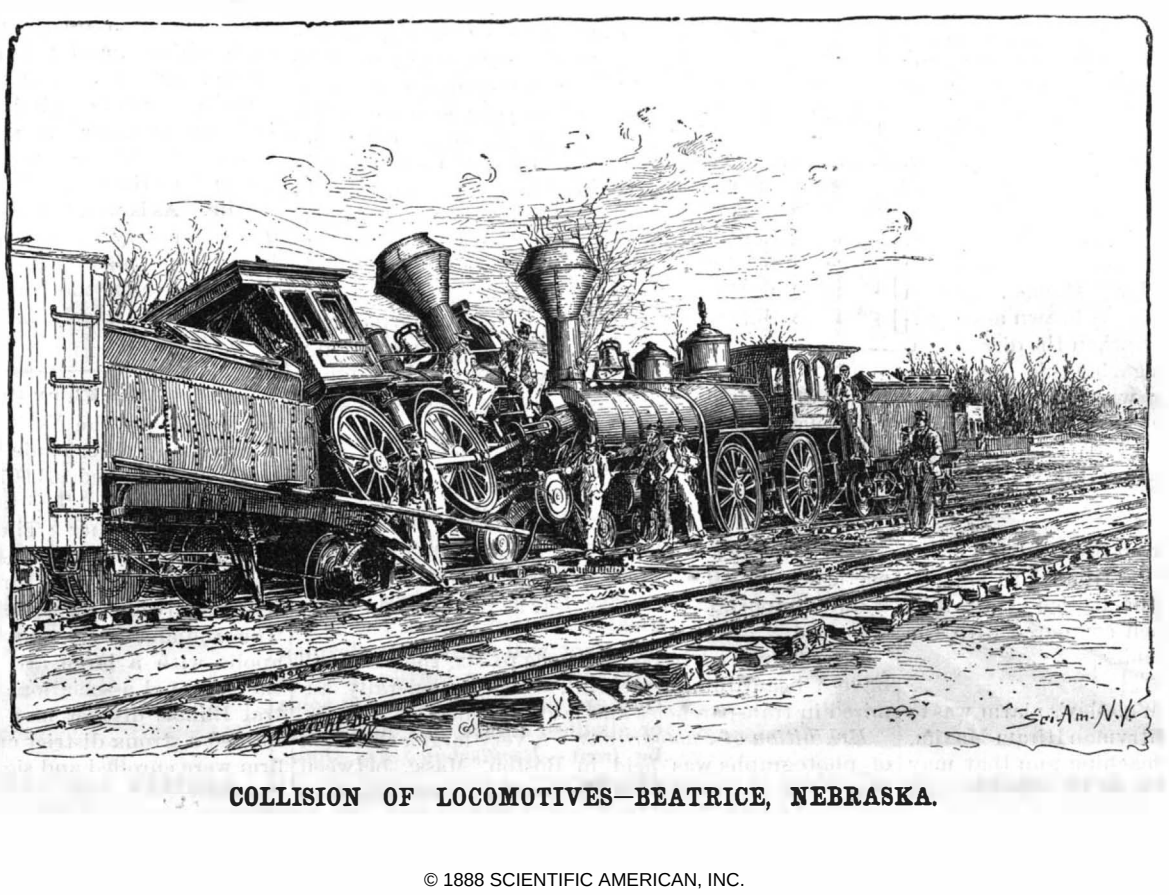
end elevation. On the casing is permanently formed a stationary lower jaw, A, in which the cable is clamped by the movable upper jaw, B, both jaws being provided with soft metal dies to prevent the wear of the cable. The movable jaw has an upwardly extending plate sliding in a recess in the casing, on the upper edge of which plate operates a cam, E, provided with trunnions, D, which form its fulcrum, and an operating handle, as shown in the perspective view. On the handle, near the cam, is a lug adapted to engage the upper inclined edge of the arm, C, of a bell crank lever pivoted on the front plate of the casing, the other arm of the lever engaging a pin projecting from the jaw plate through an aperture in the front plate of the casing. The trunnions of the cam are supported in vertically adjustable bearings, movable up and down by set screws, whereby the wear of the jaw upon the cable can be taken up at any time. To secure the grip upon the cable, the operator moves the handle toward a vertical position, when the cam presses the movable jaw downward, and the pin projecting from the jaw plate through the front of the casing moves the bell crank lever thereby. By turning the handle downward, the pressure of the cam lever is released, and the pin acting on the wedge-shaped top end of the other arm of the bell crank lever operates it to raise the jaw plate and move the jaw upward out of contact with the cable. The soft metal dies in the jaws can easily be replaced by new ones when worn out.

COLLISION OF LOCOMOTIVES—BEATRICE, NEBRASKA.

We are indebted to Mr. Charles A. Atkins, of Beatrice, Neb., for a photograph showing the position in which the locomotives were left after a collision between two trains which recently occurred at the above place. The Beatrice *Express* says:

Switch engine No. 4, manned by W. A. Waddington, was doing some switching, being at the time of the accident about to take a string of cars out on the main track. Not being aware of the near approach of a train, the switch was left open to allow them to pass out. Train No. 95, a freight which runs between Edgar and St. Joe, at this time came thundering around the curve at the rate of 25 miles an hour, and instead of keeping the main track it very naturally c a m e down on the 4-spot standing on the switch. Waddington saw the train coming, heard the engineer of 95 whistle for down brakes, and started to back up, but soon saw a collision was inevitable and jumped from his cab to the ground. The engine on the regular freight was in charge of Engineer Harry Wyman, and both he and his fireman jumped from the cab after Wyman had reversed his engine. The distance was short, however, and the speed of the oncoming train was slacked but little. The crash of the collision was heard for blocks, and people ran toward the place from all directions. The switch engine was completely knocked out, her front resting on the pilot of the other, all wheels on the right side being about four feet from the ground. Her tender went crashing through the end of a freight car and was likewise left in a dizzy position. The freight engine was less unfortunate. Though moved completely from the track, the bursting in of the front end by No. 4's cylinder head and the smashing of her cow-catcher was about the only damage noticeable. The whole thing will probably cost the company about $12,000.

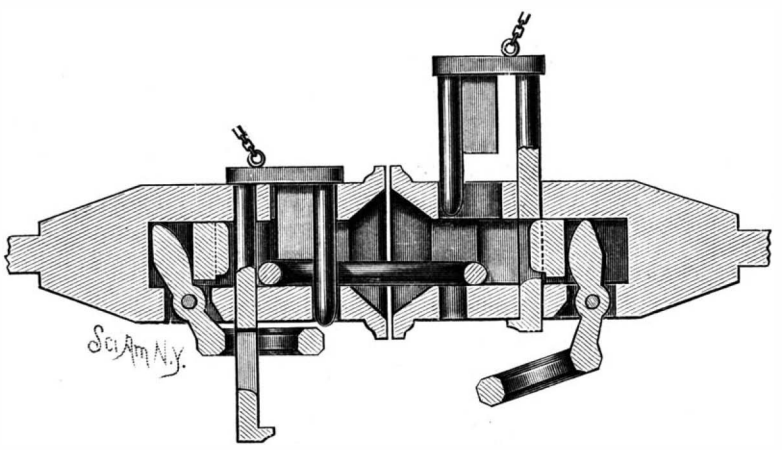
It certainly was the result of gross carelessness on the part of some one. Fortunately no one was injured.



COLLISION OF LOCOMOTIVES—BEATRICE, NEBRASKA.

AN IMPROVED CAR COUPLING.

A car coupler having but few parts, and simple and strong in construction, while it may be quickly and easily removed from the drawhead and readily replaced, is illustrated herewith, and has been patented by Mr. Luther B. Sampson, of Rochester, N. H. The coupling pin is attached by a crosshead to a guide rod, both passing through aligning apertures, one in the rear of the other, in the drawhead, the aperture receiving the coupling pin also having a space at the top to receive a weight or block attached to the pin, to carry it from an uncoupled to a coupled position, when the block bears upon the link, and acts to hold the latter in horizontal position. The guide rod has at its lower end a horizontal toe, preferably detachable, limiting the upward movement of the guide rod as the toe comes in contact with the under face of the drawhead, and a short distance above such toe there is a longitudinal slot in the rear of the guide rod. A lever is pivoted in the rear of the drawhead, bearing at its upper end against a bifurcated sliding block, between the inner faces of which is a slightly projecting tongue adapted to enter the slot in the rear of the guide rod when the latter is in raised position, as shown at the right hand in the picture, thus retaining the coupling pin above the link opening. As the link enters the drawhead it strikes against the forward ends of the bifurcated sliding block, these ends then extending forward on each side of the guide rod, forcing the block backward and withdrawing its central tongue from the slot in the guide rod, allowing the latter and the coupling pin to drop down to the position shown at the left hand in the picture. At the lower end of the lever pivoted in the rear of the drawhead is arranged a weight, designed to keep the upper end of the lever at all times in contact with the rear face of the sliding block, and this weight is preferably in link form, projecting at nearly a right angle from the lever, the aperture thus formed permitting the passage of the guide rod of the coupling pin. The raising of the coupling pin and the parts connected with it may be done in any of the well known ways from the sides or the top of the car.

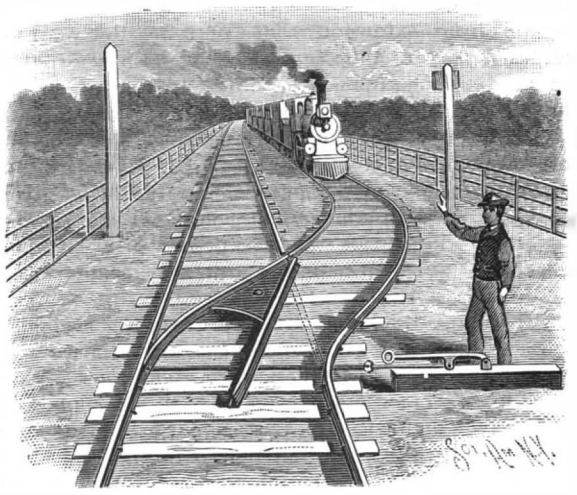


SAMPSON'S CAR COUPLING.

THE largest cannon in the world is in Ghent, Belgium. The diameter of bore is 2¾ feet.

AN IMPROVED RAILROAD SWITCH.

A railroad switch which can be easily changed to connect the main track with a side track, and which is very simple in construction, has been patented by Mr. Henry D. Baldwin, of Shullsburg, Wis., and is illustrated herewith. The switch is placed between the outer main rail and the outer side rail of the side



BALDWIN'S RAILROAD SWITCH.

track, the switch having one straight and one partly curved rail section, both secured on a switch plate held to turn on a pivot secured to one of the ties, two ends of these rail sections being slightly beveled, while their other ends are adapted to connect alternately with the ends of one of the rails of the side track or of the main track. A switch rod is secured to the under side of the switch rails, and connected in the usual way with a lever for shifting the switch. As shown in the illustration, the switch is turned so that a train can pass from a side track on to the main track. When the operator desires to close the switch to the siding, he moves the switch rod outward, by means of its lever, so that the beveled end of the partly curved switch rail is disconnected from the main track rail, and the beveled end of the straight switch rail is thrown in contact with the inside of the outer side track rail, whereby the inner main track rail is made continuous.

Asbestos to Promote Filtration.

Viscid liquids, such as are obtained in processes of artificial digestion, may be filtered, according to W. Fresenius (*Ztsch. f. Anal. Chem.*), by the aid of finely picked asbestos fiber. Not only is the filtration of such fluids exceedingly slow, but the filtrate often passes turbid even through paper of the closest texture. To filter such a fluid, Fresenius advises to dilute with water, add some recently ignited asbestos, and shake the mixture vigorously. After about twelve hours the suspended m a t t e r s will have subsided, leaving the supernatant liquid perfectly clear. This is to be siphoned off and the residue to be washed once or twice by decantation, and then passed through a glass funnel, the neck of which contains a pellet of asbestos. If the first part of the filtrate runs off cloudy, it is returned to the funnel until it passes clear.

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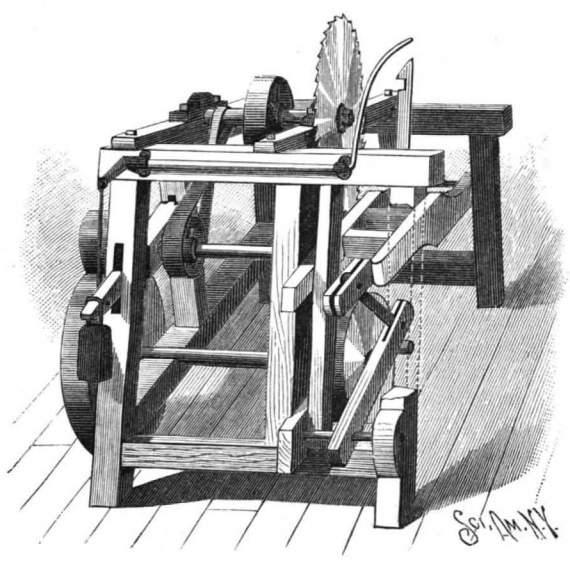
IMPROVED FEED MECHANISM FOR SAWING MACHINES.

A feed mechanism specially adapted for shingle or box sawing machines, and having a pivoted frame supporting the block carriage, with means for imparting a swinging motion to it, has been patented by Mr. Joseph W. Frank, of Emporia, Fla., and is illustrated herewith. The block carriage itself is not shown, and may be of any approved construction, but its pivoted supporting frame may be seen at the right in the illustration, a front extension therefrom passing between guides to prevent wabbling in its up and down movement. On the under side of the pivoted frame is a slotted arm, pivotally connected by a link with an arm fulcrumed on the main frame, the bottom edge of the latter arm being engaged by a friction roller held near the edge of a wheel secured to a transverse shaft in the lower front part of the main frame. There are apertures in the arms forming the pivotal connection through the link with the bottom of the pivoted frame, to increase or diminish the amount of throw given to the frame, by the required adjustment with the pivoted ends of the link. On the other outer end of the transverse shaft in the lower front part of the main frame is a friction wheel, the rim of which engages a friction pinion on a shaft above, operated by a crossed belt passing over the saw arbor, so that when the latter is rotated it also imparts motion to the shaft carrying the friction pinion. The inner end of the latter shaft is held in a bearing on the main frame, but its outer end rotates in a bearing on a pivoted arm, to which a weight is attached on the



FRANK'S CIRCULAR SAWING MACHINE.

free end, the outer end of this pivoted and weighted arm being also connected, through a link and transverse shaft on the top and front of the main frame, with a catch, whereby the arm may be held up so that the friction pinion rotating in a bearing thereon will be held out of contact with the friction wheel. When the saw arbor is operated, and this arm carrying the friction pinion is freed from the catch and held in its lowest position by the weight, the shaft in the lower front part of the main frame will be rotated, communicating an up and down motion to the pivoted frame carrying the block to be sawed, feeding the block upward on the saw. The block is of such length that when the pivoted frame is in its uppermost position, the saw has cut a shingle or board off of the block on the block carriage. When shingles are to be cut, the block is tipped by suitable mechanism, when the frame is in its lowermost position, to give the desired taper. To stop the motion of the feed frame, the operator has only to move the upwardly extending arm at the right into its catch, thus lifting the friction pinion out of contact with the friction wheel.

AN IMPROVED GATE.

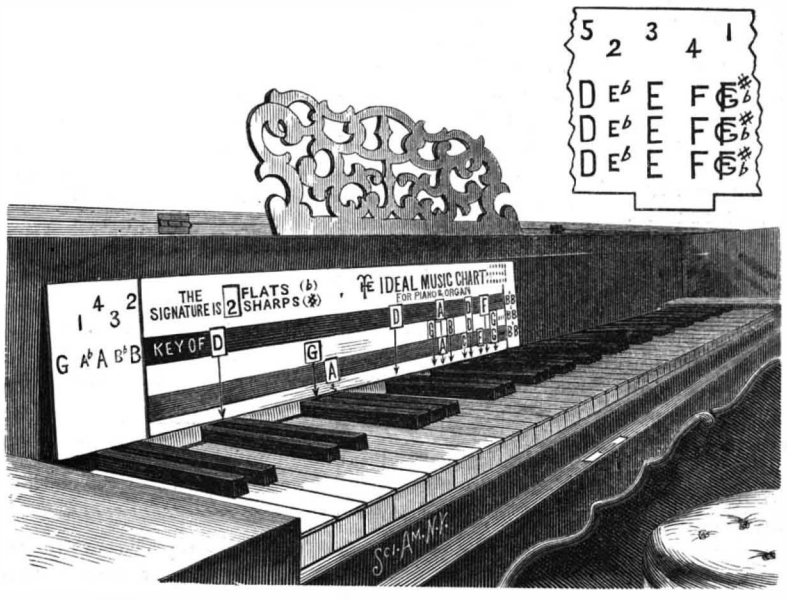
A gate that is adapted to swing or slide, and so constructed that it can be swung inwardly or outwardly, and slid back and forth, is illustrated herewith, and has been patented by Mr. Frank William Berning, of Ottawa, Ohio. It is mounted on a frame of iron rods,

BERNING'S GATE.

with a vertical side and inclined sides, and suspended from the hinge post through this frame. The outer pointed end of the frame has pivoted thereto an inclined bar or rod, which has a grooved roller at its lower forward end, upon which one of the lower bars of the gate is adapted to move, the upper end of this bar having perforations, with which the bent end of another bar is adapted to engage, the latter bar being pivoted to the side of the frame near the hinge post. By adjusting this rod in different perforations, the gate may be raised and held up in winter to clear the snow. The frame on which the gate is mounted has a grooved roller upon which one of the upper bars of the gate is adapted to move, and also a hook in which a lower bar is adapted to move, and which serves to steady the gate. To use this construction as a swinging gate, it is only necessary to slide it back sufficiently to have the latch clear the post. For further particulars with reference to this invention address Jos. Unterbrink, Ottawa, Ohio.

AN IMPROVED MUSIC CHART.

In our issue for January 21 last we gave an engraving of this invention, but as the arrangement of some of the letters was not quite as it should have been, we now present it again. It is a simple and efficient device for use in connection with pianos and organs, for transposing music from one key to another. It is illustrated herewith, and has been patented by Mr. Charles S. Mason, of El Modena, Los Angeles County, Cal. A card, which forms the body of the chart, is provided with three rows of letters, representing in three series the notes of the scale, as shown in section in the small figure. The letters represent the notes of the natural scale and sharps larger than the flats, while the flats are printed in red, so that when they are superposed upon black they may be readily distinguished. The card has projections upon its bottom edge adapted to fit into the wider spaces between the black keys of the keyboard to locate the chart with reference to the scale of the instrument, and is provided with appropriate indices and numerals representing the signatures. An apertured card, with three stripes of different colors, is arranged to slide over the other one, the apertures being in the order required for showing the letters of the different chords of the various keys, with an aperture also for exposing to view the figures on the rear card representing the signatures, the top line or color stripe representing the tonic or first chord, the second line the sub-dominant chord, and the third line the dominant chord. The chart, which only costs $1.25, cannot be wrongly placed upon the instrument, and the rapidity and simplicity with which changes can be made from one key to another are obvious at a glance.



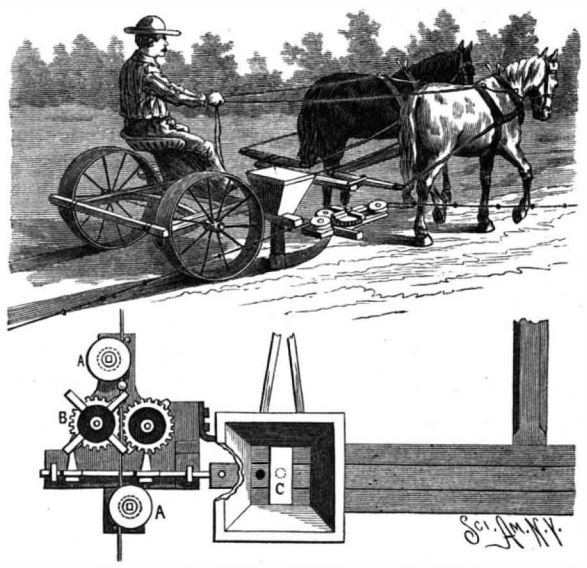
MASON'S MUSIC CHART.

Porcelain Shot.

Under this name small white globules of porcelain are made in Munich. They are made to take the place of ordinary lead shot used for cleaning wine and medicine bottles, as porcelain is entirely free from the objection of producing lead contamination, which is often the result when ordinary shot is used. Their hardness and rough surface producing, when shaken, greater friction, adapt the porcelain shot well for quickly cleaning dirty and greasy bottles, and as they are not acted upon by acids or alkalies, almost any liquid can be used.—*Rundschau; Am. Jour. Pharm.*

IMPROVED CHECK-ROW ATTACHMENT FOR PLANTERS.

A check-row attachment for planters, designed for use in connection with a rope or wire secured in the field in the usual manner, has been patented by Mr. Isaac Jackson, of Kingman, Kansas, and is illustrated herewith, the smaller figure showing a plan view of the mechanism at one side of the machine. In the bottom of each seed box is an aperture registering with a downwardly extending tube, reaching into the furrow opener or runner of the planter, while a bar held to slide transversely on the bottom of each seed box is provided with apertures to register or disconnect simultaneously with the apertures in the bottom of the seed boxes. Each outer end of the bar sliding transversely in the bottom of the seed boxes is connected by a rod with a check-row attachment, the mechanism of which is worked to discharge the seed at regular intervals by balls attached to the rope or wire secured in the field, this rope or wire being guided through the attachment by the pulleys, A A. The rod connected with the sliding feed bar has slots in which lugs are held adjustably to be engaged alternately by arms on the under side of the gear wheels, B, rotating on studs secured to the frame of the check-row attachment. On top of one of the gear wheels are secured four radial arms, each arm having a slot in its outer end, through which passes the rope or wire, the knots or balls thereon being of a size sufficient to engage the slotted ends of the arms, thereby moving each arm along as each ball passes through, and moving alternately inward and outward the rod connected with the sliding feed bar, whereby the seed is fed through the tube and into the runner to be deposited in the furrow.

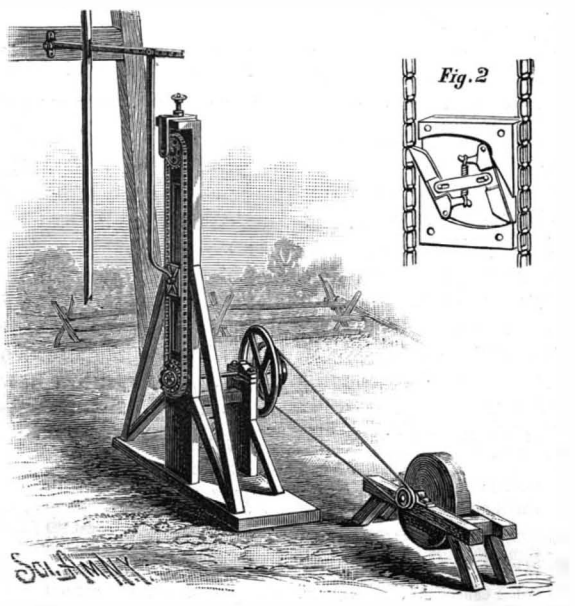


JACKSON'S CHECK-ROW ATTACHMENT FOR PLANTERS.

The stroke of the feed bar and rod can be increased or diminished by adjusting the lugs on the latter, so that it will require a longer or shorter time for the apertures of the feed bar to register with those in the bottom of the seed box.

AN IMPROVED WINDMILL MOTOR.

A motor adapted more particularly for connection to a lever operated by the pump rod of a windmill is illustrated herewith, and has been patented by Mr. George C. Hunter, of Chebanse, Ill. A main post or upright is fixed to a suitable base, and at one side of this post is fixed a shorter one, supporting one bearing of a main driving shaft, carrying on its outer end a fly wheel and a couple of belt pulleys, through which power may be conveyed for use as desired, the other bearing of the shaft being in the main post, and carrying in front of this post a cone of chain wheels or pulleys. There is on top of this post a metal saddle, the pendent arms of which afford bearings for a short



HUNTER'S AUXILIARY MOTOR FOR WINDMILLS.

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upper shaft carrying a sprocket wheel, from which a chain belt passes downward to one of the cone pulleys on the main driving shaft, the saddle being adjustable by a screw at the top, whereby the tension of the belt may be adjusted as desired. Ranging vertically on the front face of the main post is fixed a metal guide plate, on which slides up and down a pawl-carrying head, on a central pin of which head is fitted the lower end of a pitman rod, the upper end of the rod being connected to the outer end of a lever fulcrumed to a suitable support on the windmill tower, and connected with the vertically movable pump rod, driven directly from the windmill in any ordinary or approved way, of which the details are not shown. The pawl-carrying head is shown in Fig. 2, the pawls being pivoted to diagonally opposite parts of the head in such way that they have a solid bearing when they alternately engage the belt to drive it as the head reciprocates. Each pawl has a projection at its pivoted end, a spring connecting the projections of both pawls, and acting normally to throw the free ends of the pawls into engagement with the cross bars of the link belt. Each pawl is also provided with a face recess in which is fixed a pin that enters a slot at one end of a metal link, the springs holding the pawl pins at the outer ends of the link slots, so that when one of the pawls engages one side of the link belt, the other pawl will be disengaged from the other side of the belt, each pawl alternately coming into engagement as the pitman moves up and down, thereby imparting continuous rotary motion to the driving shaft. The speed of the latter may be regulated by setting the pin which connects the pitman with the lever operated by the pump rod at a greater or less distance in or out from the fulcrum of the lever.

The Perfected Phonograph.

The improvements in the phonograph have now been carried to such a degree of perfection that the instrument is practically ready for general introduction. Undoubtedly means will be hit upon from time to time to enhance the value and efficiency of the phonograph, but it stands to-day, in our opinion, far more practical and complete than was the type writer when first brought out and placed on the market. Back of all the tall talk and exaggeration on the subject, for which the daily press is chiefly responsible—certainly not those who are introducing it—is a machine of admirable performance, whose utility is so wide and various that it is hard to determine just which work will give it the largest fields of employment. And then, too, aside from the practical use, is the wonder—for wonder it is—that not only can the human voice be registered, but it can be duplicated in countless electrotypes. We may be wrong, but not greatly, in believing that this century will be memorable above others because it is that which first preserved articulate speech for after time. All poetry, of every age, is full of the yearning, one of the deepest in human nature, for the voice whose gentle greeting could be heard no more, and yet this tender sentiment will be gratified, and each elusive tone and accent now has conferred on it a perpetuity that is not an attribute of even the graven stone or brass.—*Electrical World.*

A Good Word for Leghorns.

There is no better fun in the world than keeping chickens. From Boston—and all fads originate there, says a contemporary—the hen fever is sure to spread over the South and West. If you catch it, pay attention to these few simple rules: Buy Leghorn hens—no others lay as well as these Italian fowls—and feed them liberally with a variety of grains. Give them all the scraps from the table in a hot mess each morning, with plenty of red pepper and burnt bones. Keep their quarters clean and well ventilated, and be sure that they are warm in winter. Water they should have in plenty. Herein lies the essence of all poultry wisdom. Act upon it, and you will have—with twenty hens and a couple of roosters—enough fresh eggs to supply your household all the year round. And, after all, what delicacy is there that equals an egg taken warm from the nest and popped into boiling water for one's breakfast?

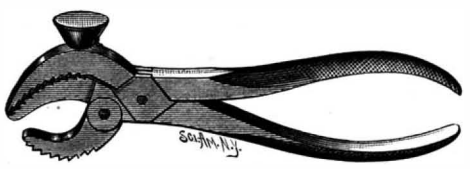
THE Thursday's lecture on April 19, on "Public Health in India," was delivered at the Parkes Museum, London, by the Hon. Mr. Justice Cunningham, who spoke as the representative of an association which has for some years past made the public health in India its especial care. The lecturer stated that the annual death roll in India was probably nearer seven or eight millions than five, which was the official return for the year 1885. The following statement shows how largely the death rate is contributed to by diseases which we here recognize as preventable:

TOTAL DEATHS IN 1885.

Cholera	385,928
Small-pox	80,630
Fevers	3,396,239
Bowel complaints	293,638
Injuries	83,262
Other causes	937,903
Total	5,177,600

AN IMPROVED LASTING TOOL.

A special form of pinchers for shoemakers and saddlers, which will not tear or disarrange the thinnest insole, is illustrated herewith, and has been patented by Mr. Joseph R. Jacques, of Hancock, Mich. On the under side of the lower jaw of the tool are ears, between which is pivoted a lip that is curved upwardly and forwardly, to contact, in use, with the lower jaw, the under surface of the lip being corrugated to prevent slipping when the lip is utilized as a fulcrum in using the tool. The lip thus forms a rocking fulcrum for the tool, and when not employed falls down out of the way. Differing from a rigid lip, which would be liable to slip and draw the inner sole from the upper, the pivoted lip remains stationary when in use, and



JACQUES' LASTING TOOL.

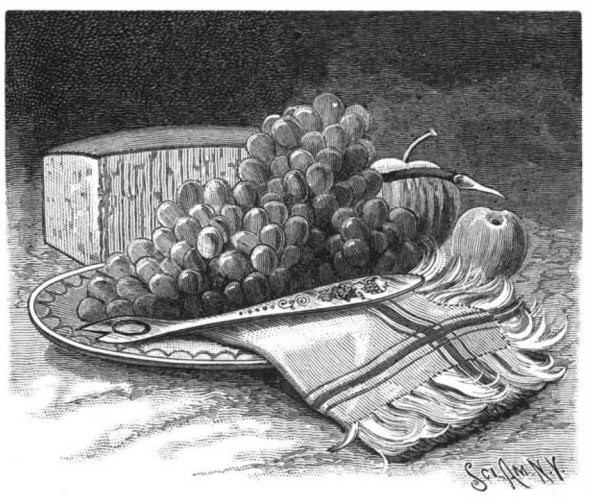
facilitates drawing the leather quickly in the direction of the middle of the last. Upon the outer surface of the upper jaw is a projection adapted for use as a hammer.

Projection of a Globule of Liquid in the Spheroidal State.

Instead of heating the globule in a metallic capsule, polished so as to give perfect reflection, Professor P. Colardeau recommends, in Buguet's *Journal de Physique*, the use of the ever brilliant surface of mercury as the mirror. The mercury is placed in a porcelain capsule, and the whole is heated on a water bath to a temperature of 212° Fah. Next a drop of ether is allowed to fall upon the mercury, and from any source of light a beam is directed upon it by means of a prism arranged for total reflection. The reflected beam of light is caused to fall upon and pass through a convex lens or regular objective, and thus there is produced upon the screen a sharply defined image of the drop. The mercury retains its heat long enough for convenient observation of the projection of the phenomenon.—*Rivista Scientifico-Industriale.*

IMPROVED UTENSIL FOR EXTRACTING GRAPE SEEDS.

A simple and serviceable implement for extracting the seeds from grapes before eating them, and which may be made in quite ornamental patterns, is shown in the accompanying illustration, and has been patented by Sarah E. Toucey, of New York City (P. O. box 2425). It has a flat pick, with a sharpened point on its end in line with the handle, a cavity in its top face, and a cutting blade projecting laterally from the pick, its point forking out therefrom a short distance within the point of the pick. The top of the grape can, with this utensil, be quickly sliced off by the cutting blade, so as to uncover the grape seeds, when, by



TOUCEY'S GRAPE SEED EXTRACTOR.

introducing the flat pointed pick beneath them, they can be readily received in the cavity and removed without injuring the edible part of the grape.

PEROXIDE of hydrogen, according to Dr. Love, of St. Louis, is a most valuable agent in the treatment of diphtheria, ozæna, and in all cases of cancerous ulceration and of suppuration or necrosis. He employs it in a solution containing 0·5 to 3 per cent, using most frequently, however, a strength of one per cent, diluting the commercial "ten volume" peroxide with two or three times its volume of water. Of its value in clearing away and effectually deodorizing the decomposing exudate in cases of diphtheria he speaks in the most emphatic terms, and he regards the remedy also as one of great usefulness in scarlet fever, whooping cough, and other specific diseases.

On the Detection and Estimation of Magenta in Orchil and Cudbear.

BY CHRISTOPHER RAWSON, F.I.C., F.C.S.

Various methods have been proposed from time to time for detecting the presence of magenta in orchil and cudbear. But on account of the difficulty hitherto experienced in completely separating orsein from salts of rosaniline, there are few, if any, published methods which are sufficiently delicate to detect very minute quantities of magenta in these coloring matters. H. Crossley* precipitates the magenta by ammonia, and E. Knecht† makes use of caustic soda for the same purpose, but since rosaniline is appreciably soluble in alkalies, a small quantity of magenta would be entirely overlooked by the employment of either of these methods. Liebmann and Studer‡ saturate a solution of the orchil or cudbear with sulphurous anhydride, and after filtering, add either acetone or aldehyd, when, if magenta be present, the color of the liquid changes from red to violet. They state that by this reaction $\frac{1}{10}$ per cent of magenta in cudbear can be detected. In making use of this process, on account of the cudbear which remained in solution after saturating the liquid with sulphurous anhydride, I have been unable to detect such a small quantity.

The method which I have to propose is based upon the complete precipitation of the coloring matter of orchil and cudbear in an aqueous and alcoholic solution by basic acetate of lead, followed by an excess of ammonia. Magenta, under the same conditions, remains in solution.

From 1 to 2 grammes of cudbear (or an equivalent amount of orchil liquor) are boiled with 50 c. c. of alcohol, and afterward diluted with 100 c. c. of water; 15 to 20 c. c. of a strong solution of basic acetate of lead (sp. gr. 1·25) are then added, followed, after stirring, by a similar quantity of strong ammonia. The mixture is filtered, and if the amount of magenta present is to be *estimated*, the precipitate is washed with a solution containing 1 part of ammonia, 5 parts of alcohol, and 10 parts of water; otherwise the washing may be neglected. With pure cudbear the filtrate is quite colorless; if magenta be present it is either colorless or pink, according to the amount of ammonia present in the solution. The liquid is then acidulated with acetic acid, when the presence or absence of magenta is at once made apparent; in the case of pure cudbear or orchil the solution remains colorless, whereas, if a salt of rosaniline be present, the well known color of magenta is immediately developed. If further proof be wanting, a small piece of worsted yarn may be dyed in the solution and afterward tested in the usual way with such reagents as hydrochloric acid, caustic soda, and a mixture of hydrochloric acid and stannous chloride.

By means of this method I have been able to detect with certainty 1 part of magenta in 100,000 parts of cudbear.

For determining the *amount* of magenta present, I make use of a colorimetric process. A standard solution of pure magenta is prepared so as to contain $\frac{1}{100}$ milligramme per c. c. It is acidulated with acetic acid in order that it may be under the same conditions as the solution to be tested. The latter is made up to a known bulk, say 250 c. c. (or, if magenta present be very small, concentrated to 100 c. c. and the whole taken for estimation), and an aliquot part run into a Nessler tube and diluted to 100 c. c. The standard solution of magenta is then run from a burette into a second cylinder in such quantity that the depth of color is equal to that in the first, as in the case of Nesslerizing ammonia. The amount of magenta present in the sample of cudbear or orchil under examination can be then readily calculated. In place of Nessler tubes the colorimeter or Lovibond's tintometer might be used with advantage.

It will no doubt be apparent from what I have already stated that this method is capable of detecting very much smaller quantities of magenta than the manufacturer of cudbear would ever think of using for the purpose of adulteration. But as the amount present can, at the time, be easily and readily estimated, there is little danger of genuine cudbear which may have become accidentally contaminated with a trace of magenta being pronounced sophisticated.

In a valuable paper on the "Detection of adulterations in orchil and cudbear," F. Breiul§ employs basic acetate of lead for detecting magenta and other basic coal tar colors. Some time previous to the publication of that paper, however, I tried the same reagent at the suggestion of my friend Dr. E. Knecht, but a considerable amount of cudbear still remained in solution, and it was only by adding an excess of ammonia or soda that it was completely precipitated.—*Chemical News.*

THE Bank of England is the most extensive banking institution in the world. It employs over 1,000 clerks, and its buildings cover 8 acres.

* *Journal of the Society of Dyers and Colorists*, vol. ii., p. 23.
† *Ibid.*, vol. ii., p. 58.
‡ *Journal of the Society of Chemical Industry*, vol. v., p. 287.
§ *Mitth. d. Techn. Gewerbemuseums in Wien*, 1887, 37.

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THE ITALIA.

(*Continued from first page.*)

The estimated weights of the hull, armor, etc., were given approximately as follows:

	Tons.
Hull	5,000
Armor of armored deck	1,200
Armor of citadel	900
Armor of ammunition shaft	246
Armor of chimneys	552
Total weight of armor	2,898
Teak backing	114
The total weight of the machinery is about	2,200

The armament consists of four 43 cm. (110 ton) R. L. R. guns supplied by Armstrongs. There are eight 15 cm. (6 in.) Armstrong breechloaders. Six of these are carried on the upper deck, two being respectively bow and stern chasers. There are six smaller quick-firing guns of 57 mm. caliber.

There are machine guns, comprising twenty-two Hotchkiss and quick-firing guns for the boats and landing parties. There will also be a number of Maxim guns.

There are four torpedo ports arranged on the broadside, two ahead and two astern.

The two sets of engines for driving each of the Italia's twin screws have each three cylinders of equal size arranged in line on the shafting. At full speed they all take steam direct from the boiler, but in ordinary working the foremost cylinder of each set alone takes steam from the boiler, and exhausts into the other two cylinders. There are thus six cylinders to each propeller. The engines are placed amidships, the boilers being placed fourteen before and twelve abaft them. The shafting runs under the after boilers. It is this unusual arrangement of the boilers which gives the vessel the somewhat peculiar appearance due to the position of the six chimneys, which it will be seen by our engraving are placed in two groups of three each before and abaft the barbettes. The latter are placed *en echelon*, and each one carries two of the monster 100-ton guns. The barbettes are contained in an armored casemate, which is supported by the unarmored structure of the ship, a point in design that has raised many adverse comments from naval critics in this country. The space thus inclosed is entered from below through an armored shaft, which leads below water to the space between the forward and after sets of engines. This armored tube serves as an ammunition shaft. The bases of the chimneys in each group are also protected by armored belts. The plated deck completes the armored protection of the ship. This deck extends from stem to stern, the armor being of steel, and 3 in. thick. The body plan of the ship shows this deck in a uniform curve extending from side to side. Where it springs from the skin of the vessel it is about 5 ft. 6 in. below water line, and at its highest part it is about 1 ft. 6 in. below the level of the water. These figures are those which were allowed for in the design, but we believe, as a matter of practice, the Italia, like so many other war ships, has accumulated weight during construction, so that the deck is more submerged still. It is this under-water arrangement of the armored deck that has been so unfavorably criticised, and it may be noted that in the succeeding ships, Re Umberto, Sicilia, and Sardegna, the crown of the deck has been raised considerably above the water level, so as to conform more nearly to the arrangement followed in our own smaller protected ships of the Mersey type.

Steel is largely used in the construction of this vessel, and when we remember that she was commenced ten years ago, we feel we have another reason to admire the courage and prescience of her designer. The bottom is sheathed with wood. The double bottom has 3 ft. 3 in. between the two skins in the midship part. There are two longitudinal water tight bulkheads, extending fore and aft for 254 ft. Altogether the hull is divided into 53 vertical divisions, these being split up again horizontally by the four decks. Cork stuffing is extensively used in the side compartments. Six feet above the water line is a deck of ordinary plating covered with wood; and above this is the battery deck, having a height of 14 ft. above the water line. Again, 7 ft. 9 in. above this is the upper deck, which supports the casemate containing the big guns mounted *en barbette*. The great height at which the Italia carries her guns is a very strong point in favor of her design, such an element being to a war ship of the present day, when armored decks form so important an element of defense, very much what length of reach is to a boxer. High speed is another and perhaps the most important advantage that was aimed at as a counterbalancing advantage in dispensing with side armor. The under-water shape of the Italia is very beautiful, and in looking at her model one is forcibly reminded of a remark of our present director of naval construction, Mr. W. H. White, that however unsightly modern war ships are to view afloat, some of the most beautiful forms ever produced by the naval architect were hidden from sight below the water line of the ungainly superstructures. It was hoped that the Italia would steam 18 knots, and this was all but got on her trial, the speed we believe that was registered being as stated 17·8 knots. The power developed by the engines was considerably short of the contract. It was expected to get 18,000 indicated horse power, but there was a very large falling off from this. There was, it is said, a difficulty in getting air down to the furnaces, and the necessary amount of coal could not be burnt. Alterations and improvements are now in course of consideration, and no doubt will lead to an increase in the power developed.

To Builders and All Who Contemplate Building.

A large number of the builders in the United States and Canada keep on file, not only for their own benefit, but for the use of their customers, all the numbers of the ARCHITECTS AND BUILDERS EDITION of the SCIENTIFIC AMERICAN, which they are pleased to show to persons contemplating building, and they find their business has been promoted by so doing. From the working plans so fully given in this publication, after the design for the elevation or style of the house has been selected, builders are enabled to give a close estimate of the cost of construction. But most persons contemplating the building of a house or stable for their own use derive both pleasure and considerable saving, sometimes, by carefully considering at their leisure, and by their fireside, various designs and plans which may come before them. To enable a person to come to a wise conclusion in such an important matter as building a home for his family, he will be wise if he brings the subject before his entire household, and studies carefully over in the domestic circle the many plans he should provide for their consideration. It will not only afford great pleasure to the entire family to be considered in the matter, but good suggestions will come from it, and mistakes will be less likely to occur in the selection of the plans and in the construction of the building. By all means consult the wife and grown-up daughters, if so fortunate as to have them, and to this end everybody who contemplates building is advised to provide himself with a complete file of the ARCHITECTS AND BUILDERS EDITION of the SCIENTIFIC AMERICAN—31 numbers already published—and then he will have at hand not only the best material to select his design for a house from, but he will also find it useful and profitable to refer to while the building is being constructed.

In this connection we assert, without fear of contradiction, that every number of the ARCHITECTS AND BUILDERS EDITION of this paper which has been published contains useful and important information for every one about to build, and facts not obtainable elsewhere. And if the possessor of the last issue or any other single number which has happened to fall into his hands does not find the design for a house, stable, store, or other structure he contemplates building that suits his fancy or the estimate of the cost is too great, he will be very sure to find in some one of the other thirty numbers something that will suit both his fancy and purse. Hundreds of dwellings have been erected on the plans that have appeared in this publication, and every one who contemplates building, or who wishes to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, should not fail to provide himself with a complete set of the ARCHITECT AND BUILDER, which is published on the first of each month, at the office of the SCIENTIFIC AMERICAN, 361 Broadway. Single numbers by mail 25 cents, and in paper covers $2.50 a volume of six numbers, also for sale by all newsdealers.

A New Life Boat.

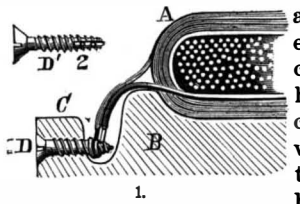
Some interesting experiments were made recently at St. George's dock, Liverpool, with a new life boat, the invention of Messrs. Gray and Hughes, and built by Mr. R. R. Gray, at his works at the Queen's dock. The boat is 16 feet in length, with a beam of 5 feet 6 inches, and 2 feet 6 inches in depth. She is built of galvanized steel sheets, and is in 20 watertight compartments. When not in use, she can be transformed into a deck seat. When in this form, directly she is lowered, or in any way touches the water, she folds together, and is kept in position by a clip at each end of the boat, which is at once screwed up. The boat will hold from twenty-five to thirty passengers, and has life lines outside her bulwarks, which will assist as many more in keeping afloat. She will carry over four tons dead weight. The watertight compartments are so built that they can be used for storing food, etc. The life boat can also be fitted with two masts, and has eight life buoys, which can be instantly detached and thrown overboard. Experiments were made to illustrate the *modus operandi* of putting her into the water, in this case by means of a crane, which lowered the boat into the water. Immediately on touching the water, the boat was transformed from a deck seat into a life boat fully equipped for a voyage. Several people then got in, and were rowed about the dock, after which she was hoisted up and resumed her position as a deck seat. It is stated that the boat can be put into the water in any position, but will always right herself.—*Iron.*

Correspondence.

Improvement on Simple Electric Motor.

To the Editor of the Scientific American:

Referring to your article on "How to Make a Simple Motor," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, the method of joining the ends of the armature coils to the screws forming the commutator can, I think, be improved in this way. See Figs. 1 and 2.



1.

The wood, B, being turned away so that the inner ends of the screws, D, are clear, then by a file or hack saw a slit could be cut in the screws, which would admit the ends of the armature wires. Now, both wires and screws being well tinned, if placed in position a drop of solder and a hot iron will complete the connection. As the screws will wear and burn, they will have to be replaced, and by a hot iron this can be readily accomplished without injury to the wires, as they do not have to be bent or scraped in any way. J. T. WHITNEY,

Assistant in Physics, Ohio State University.

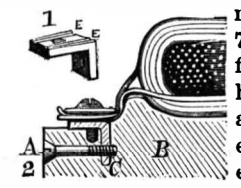
Columbus, O., April 24, 1888.

[The improvement suggested is undoubtedly practical, and may be adopted to advantage by those desiring to make a motor of the kind referred to; but it involves the use of a hack saw and soldering iron in addition to the tools required in the construction of the motor as originally described. The motor was designed to be made with common tools, such as may be found in almost every dwelling house. If one has an engine lathe and a full complement of metal and wood-working tools, the construction of an electric motor becomes an entirely different matter. In such a case a motor might be made in the regular way more readily, perhaps, than in the manner suggested. It is our purpose to publish a full description of a "regularly made" electric motor in the near future.—EDS.]

A Commutator for the Simple Electric Motor.

To the Editor of the Scientific American:

As I am interested in making the simple electric motor described in No. 11 of the SCIENTIFIC AMERICAN, I will describe my method for making the commutator. The parts are few and easily made by all those who have small screw-cutting tools, and will afford a more certain means of connection than to place the armature wires in the wood and trust to a sure contact between the wires and the wood screws. From a piece of ¼ in. sheet brass, or any other suitable material, cut 12 L-shaped pieces, 7-16 in. each way (Fig. 1). Next fit each piece into the wooden hub in place of the holes for the armature wires, taking care that each piece is embedded almost entire in the wood (Fig. 2). Drill the 12 holes in place of the wood screws, through the piece of brass, from the end of the hub, and pass a lap through.



Procure 12 brass rivets, A (with washers), of sufficient length to reach from end of hub to L, cut threads on each one and fit into the hub, passing through the L (Fig. 2).

Drill and tap each L on its upper surface for a machine screw and washer, D, cutting a small groove, E, at the edge of each for the wires from the coils. Place the armature wires under the washer and fasten with the screw in the order described in the description of the motor. GRANT J. THOMAS.

[The remarks in connection with the letter of Prof. Whitney will apply in this case.—EDS.]

The Age of the Stars.

A very interesting address delivered at the annual public session of the five academies of France, October 25, 1887, by M. Jannsen, the director of the observatory at Meudon, France, is published in the December numbers of *Ciel et Terre* and the January and February numbers of *L'Astronomie*. The principal thought is that the idea of evolution may be applied to the stars as well as to terrestrial things. The stars are not fixed and eternal, but are subject to change and time. They have a beginning, a period of activity, a decline, and an end. By recent advances in the study of celestial physics, especially with the spectroscope, we are enabled to know something of the actual condition and relative age of some of the stars. We may assume that the age of stars, other things being equal, will depend upon their temperature, and that their temperatures are higher in proportion as their spectra are richer in violet rays. The majority of the stars which are visible to the naked eye are white or bluish, and therefore at a high temperature; but many are yellow or orange, like our sun, showing that they have passed their youth, while others are from dark orange to dark red, showing that their sidereal evolution is far advanced. —*Sidereal Messenger.*

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Engine Foundations.

There is not a detail in engine construction and operation that merits greater consideration, or is of greater importance to the successful working of an engine, than the foundation upon which it stands, and too much care cannot be accorded it, that it shall have ample spread, stiffness, unity, and adaptability to the movements and operation of the parts which it supports. It should be so bonded and tied that unequal settlement shall not take place, and the height, weight, and base should be of such proportion that when the engine is in full operation there shall be no swaying or twisting of the parts, no heating of the journals, no springing or tremor of the bed arising from an unsuccessful transmission of the strains. The higher the speed and revolution, the stiffer and more solid should be the foundation, and the greater the base contact with the supporting earth. A good foundation will often decrease the defects of a poor bed, provided, of course, that such engine bed be properly and thoroughly bolted to its foundation. When properly constructed, and tied together, the engine bed and its foundation should be portions of one complete whole, inseparable and undisturbed in their relationship by the movements of the engine parts while at their hardest work.

A good bottom of concrete of smooth upper surface laid upon a rock or solid earth bottom, upon which the main structure of brick is laid close and jointed with first quality of cement, and the whole capped with one or more large blocks of stone jointed and placed to suit the engine bed, and to distribute the weight over as great an area as possible, constitutes the best foundation. Where bricks are scarce the foundation above the concrete bottom may be all of stone, and the larger the stones the better.

Ordinary rubble work is not to be relied upon, the only capacity for retaining and uniting the structure as a whole being contained in the cement. The irregular shape of the stones forming the rubble masonry present, through their lack of contact with each other, rather a precarious and unreliable bond, and the cement is too thinly laid to fix them permanently in their position, in spite of the thrust and twist of engine operation. It is far better to mould a complete foundation of concrete, capping it, if possible, with the thick solid blocks already mentioned in connection with the brick foundations. The foundation completed and thoroughly set, the engine frame or bed may be placed in position and lined up, and the joints filled and packed with melted sulphur.

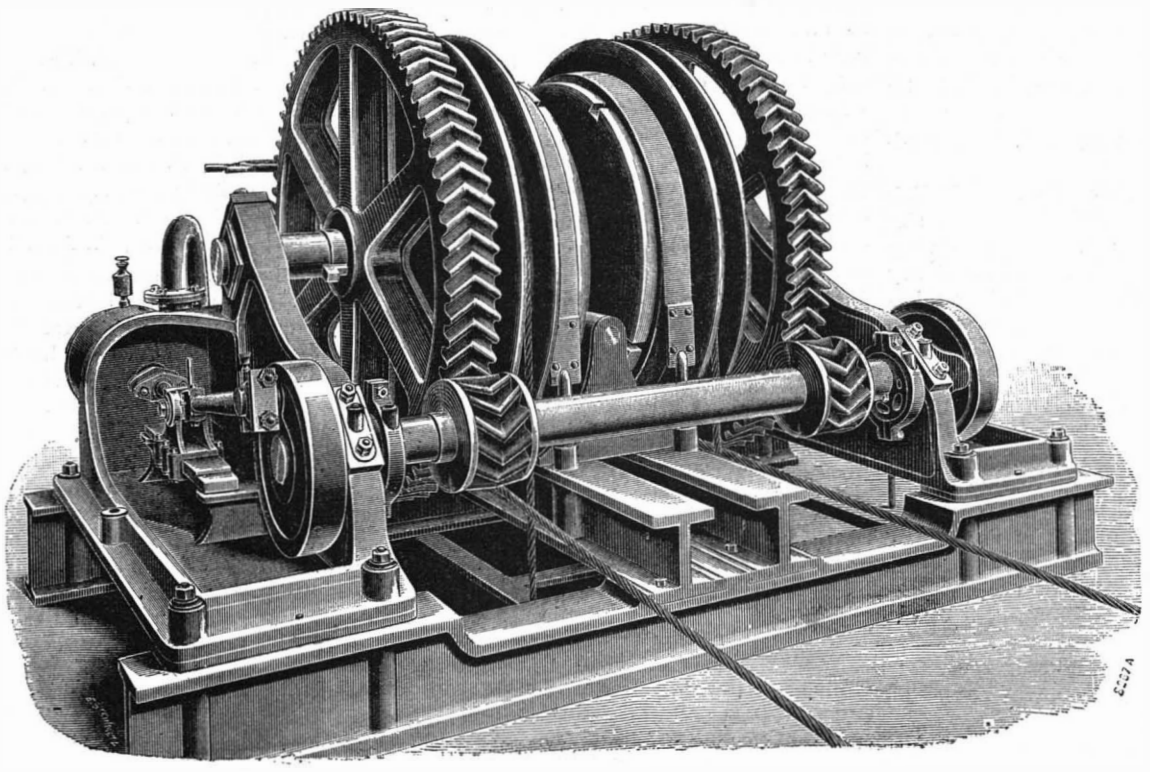
The actual nature of the soil or bottom upon which the engine and foundation is to rest, whether it be wet, soft, and elastic, whether it be dry, sandy, and solid, or whether it be a rock bottom, to which the bed might be immediately fastened with a mere leveling foundation between, determines the nature, extent and scope of the foundation, while the size, weight, and power of the engine determines its weight and bulk to prevent vibration or tremor.—*The American Engineer.*

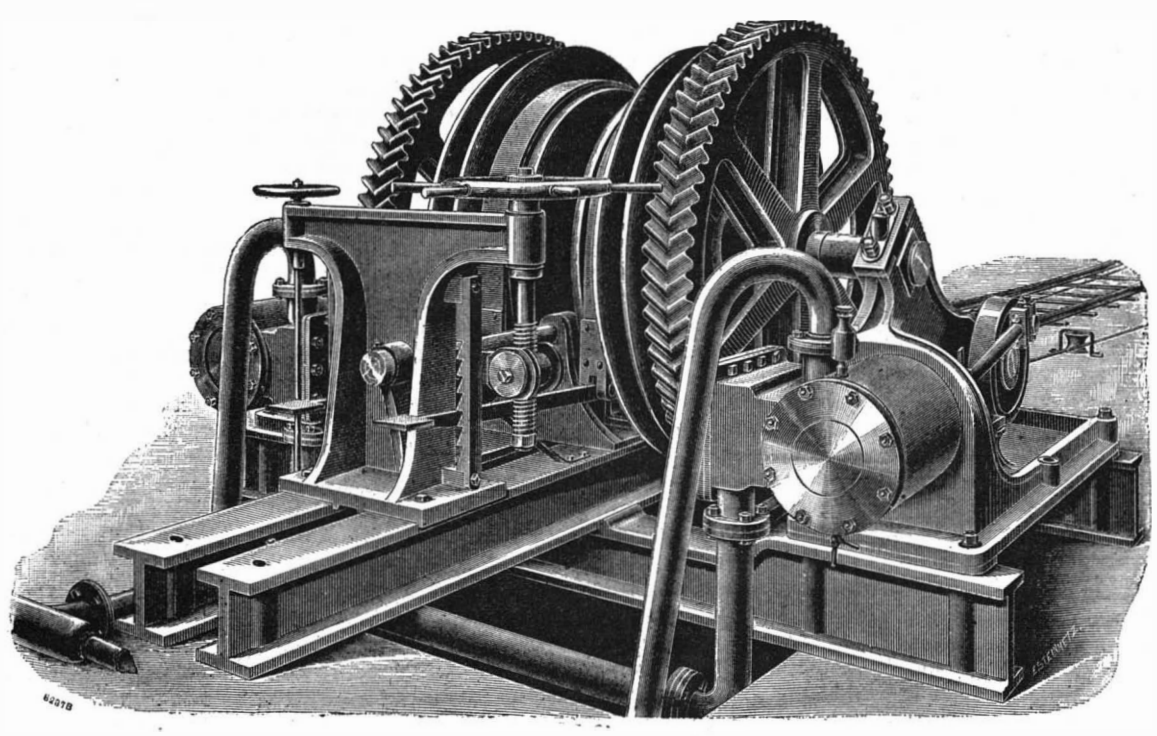
Clean up the Cellars.

The spring months, truthfully says a contemporary, are apt to be sickly in country places, partly because of confinement of people during the winter in ill-ventilated rooms over damp cellars filled with vegetables. Malarial fevers attack older people, while diphtheria is the scourge of the young, especially those kept mostly in the house. The common city plan of heating the house from the cellar by furnaces and registers avoids this evil by giving better ventilation from the cellar to the garret. It also precludes storing many vegetables in the cellar, as in a warmed air they will not keep. Confinement in bad air and drinking impure water result in poisoning the blood, thus aggravating nearly every form of disease. Where the water is suspected of being impure, boiling it destroys its poisonous elements. Western people have by long practice in fighting them learned much about malarial diseases. They consider coffee thoroughly browned a specific against malaria.

ENDLESS ROPE HAULING MACHINE.

Our engravings represent a front and back elevation of a hauling engine made by the Lowca Engineering Company. The cylinders are 10 in. in diameter, with a 12 in. stroke. The engine is compact, self-contained, and requires no foundation. The duplicate helical





IMPROVED ENDLESS ROPE HAULING ENGINES.

gearing is in the ratio of five to one. There are two driving drums 4 ft. in diameter, with a friction clutch between them, which can be thrown in and out of gear when the engines are running at full speed. Each drum is provided with a strap brake, which throws itself out of gear on releasing the brake lever. The drums are designed for endless rope haulage, and around these the rope is wound two or three times to obtain the requisite driving adhesion. The rope is kept taut by passing round a terminal tension pulley.—*Engineering.*

The Philadelphia System for Underground Electric Wires.

The town council have control of all electrical work, and some time ago they determined that all overhead wires should be undergrounded, which has been done. The engineer to the council, Mr. D. R. Walker, has just sent in his annual report to the mayor, describing the behavior of these underground cables, which are used for telephonic, telegraphic, and electric light service. There are four companies in Philadelphia now using Waring underground cables, viz., the Brush Company, the Keystone Company, the United States Company, and the Underground Electric Light and Power Company. The Brush Company are using sixty arc lamps in one of their circuits, which is five miles long, and is worked at a pressure of 2,800 volts, or about 45 volts per lamp. The lamps are generally placed at intersections of streets, and at a distance of about 500 feet apart. The cable for the Brush lamps consists of a seven strand 14 B. W. G., with insulation of from one sixteenth inch to three thirty-seconds inch, and protected with a lead covering one eighth inch thick. The same cable is used by the Keystone Company in a fifteen mile circuit at 2,000 volts, and no difficulty has been found in working it. Along Chestnut Street the electric light cables are laid side by side with telephone and telegraph cables in a cast iron duct 20 inches by 30 inches. In Broad Street the cables are laid in a wooden trough covered with a plank and close under the pavement. According to the report, nine tenths of the difficulties experienced with underground work were not in the cables themselves, but in the connections with the overhead portions. Mr. Walker also mentions an interesting case where lightning struck an overhead connection on an underground circuit, ran through three miles of cable, and burned the dynamo. The cable itself, however, was not injured.

The Black Hole of Calcutta.

The Iowa State Board of Health, in its April bulletin, concludes that few who have heard of the "Black Hole of Calcutta" know the terrible facts that have rendered the place famous and made it the synonym of all that is to be dreaded from foul air and overcrowding.

At eight o'clock on the evening of June 20, 1756, one hundred and forty-six prisoners, officers and men, black and white, and of different nationalities, were thrust into a room eighteen feet square—with two windows on one of the four sides heavily barred with iron—giving to each inmate forty cubic feet of space. In ten hours one hundred and twenty-three were found dead—only twenty-three being alive! Another instance is where, in 1742, the High Constable of Westminster, London, committed twenty-eight persons to prison, where they were thrust by the keeper into a hole six feet square and five feet ten inches high—the windows being close shut. In a very short time four of the inmates were suffocated!

These facts show the poisonous effects of the human breath—or of respired air. Prof. Brown-Sequard has recently made some experiments that are not only highly interesting, but show why the expired air of man and animals is so deadly. From the condensed vapor of the expired air he produced a liquid so poisonous that when injected beneath the skin of rabbits it produced almost instant death. This poison he found to be not a microbe, but an alkaloid. His conclusions are that the expired air of all animals contains a poison more fatal than carbonic acid.

It is well for the people to understand these facts. They cry aloud for better ventilation and purer air—for less crowding in home and church and hall and school room.

GREAT are the wonders of the telephone. A physician reports to *Gaillard's Medical Journal* that he was saved a two mile ride through a driving storm the other night by having the patient, a child, brought to the instrument and held there until it coughed. He diagnosed false croup, prescribed two grains of turpeth mineral, and turned in for an undisturbed sleep during the remainder of the night. He found the patient in the morning doing nicely—under the care of another doctor.

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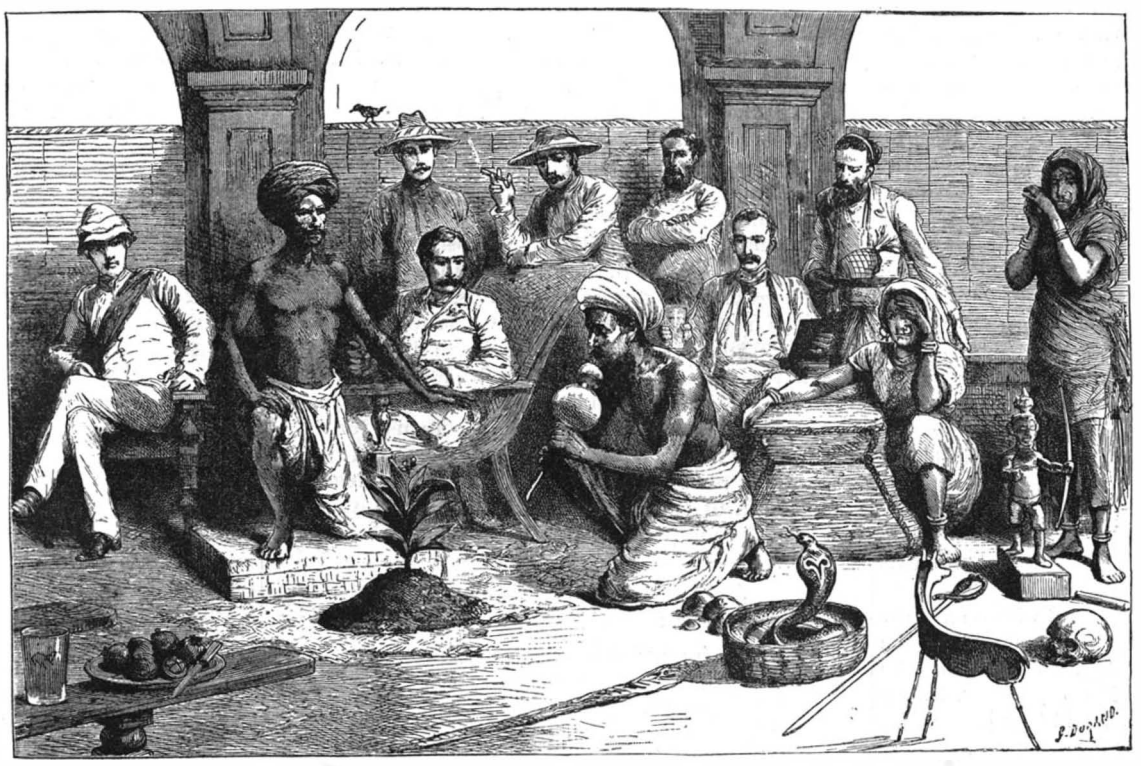
INDIAN MAGIC—THE CELEBRATED MANGO TREE TRICK.

This performance was given by a renowned South Indian juggler in the veranda of the large mess house in Colombo. Before the conjuror was worked up to perform this seeming miracle, he exhibited some sleight-of-hand marvels. His partner, with the gourd pipe, made a hideous spectacled "cobra" go through its feats. A woman of the troupe was put, tied up with cords, into a basket placed on the cement floor. She screamed as a sword stabbed through the sides of her prison. Yet when its lid was opened she had disappeared, to return and sit by its side.

At length the renowned conjuror, with due solemnity, proceeded to his most remarkable performance. He exhibited a dried mango seed to the spectators, and then planted and watered it in a mound of earth brought for the purpose. Aided by no sleeves, dress, or paraphernalia, he waved over and covered the small plot with a silk handkerchief. When he raised this for the first time a young shoot with leaves had appeared. Again the silk bandanna covered it; again it was lifted, and disclosed the crisp young plant putting forth a few more leaves and stalk. All the spectators were carefully watching and observing the movements of the great artist. He was himself tremendously excited, and when successively with more waves of the handkerchief the mango tree had grown in stature to a couple of feet high, with clean green leaves on a stalk which sprang from the interior of the stone that was firm with its roots in the undisturbed moistened earth, there was a tumultuous burst of applause. He then handed round leaves which he broke off the sturdy little tree. All the beholders declared this performance most wonderful, and all sorts of arguments and theories were started to explain how such a seeming impossibility could be effected.



MAGIC IN INDIA—THE CELEBRATED MANGO TREE TRICK.

The foregoing description and the drawing from which our engraving is taken are by Major-General H. G. Robley.—*The Graphic.*

PRIZE FIELD DOGS.

The accompanying cuts, taken from *L'Illustration*, are portraits of the conquerors in the field trials which took place at Esclimont, near Rambouillet, France, on the grounds of the Duke of Rochefoucault-Doudeauville. The first represents Prince Fred, a magnificent English setter, which belongs to Mr. A. Grassol, of the Mamers forests. This dog, which was born June 3, 1884, was entered by his owner in the contest of French and foreign dogs for the long trial. He won the first trial, run against Jubilee-Jalap, a pointer belonging to Mr. Margueritat, and was recalled with Tetsham Trip, English setter, entered by his owner, Mr. Frederic Lowe. After some remarkable work Prince Fred came off conqueror and gained the first prize, which is worth 810 francs.

In the competition for dogs for the short trial the prize was won in the first trial, no dog having been recalled, by Sacquine, a stiff haired *griffon*, entered by her owner, Mr. Guerlain, against Dick, a St. Germain hound belonging to Mr. A. Thierree. The value of the first prize for the short trials was 835 francs.

Rings as Evidence of Age in Trees.

An agent of the United States Forestry Department, Mr. R. W. Furras, who has given much study to rings in timber as indicating the age of trees, has reached the following interesting conclusion: "Concentric or annual rings, which were once accepted as good legal evidence, fail, except where climate, soil, temperature, humidity, and all other surroundings are regular and well balanced. Otherwise they are mere guesswork. The only region, within my knowledge, where either rings or measurements were reliable indications are in the secluded, even, and regularly tempered valleys of the Southern Pacific coast. Annual measurements of white elm, catalpa, soft maple, sycamore, pig hickory, cottonwood, chestnut, box elder, honey locust, coffee tree, burr and white oak, black walnut, osage, orange, white pine, red cedar, mulberry, and yellow willow (nineteen species) made in southeastern Nebraska show that an 'annual growth is very irregular, sometimes scarcely perceptible, and again quite large,' and this he attributes to the difference in seasons. As trees increase in age inner rings decrease in size, sometimes almost disappearing. Diminished rate in growth after a certain age is a rule. Of four great beeches mentioned in London, there were three, each about 17 feet in girth, whose ages were respectively 60, 102, and 200 years. Mr. Furras found twelve rings in a black locust six years old, twenty-one rings in a shell bark hickory of twelve years, ten rings in a pig hickory of six years, eleven rings in a wild crab apple of five years, and only twenty rings in a chestnut oak of twenty-four years. An American chestnut of only four years had nine rings, while a peach of eight years had only five rings."

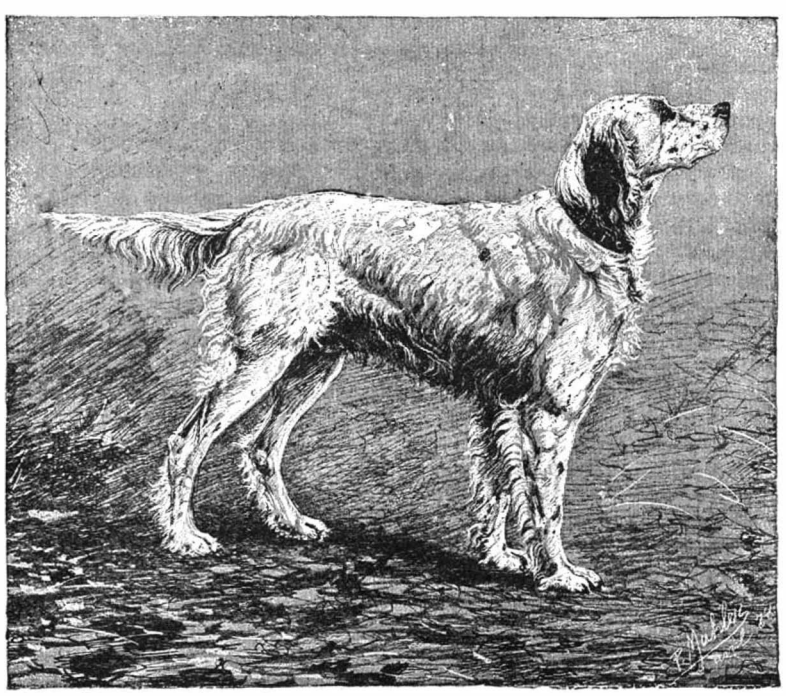
IN a gallon of sea water there are 1890 grains of salt, besides some magnesia, iodine, and bromine.

Mining Trust Schemes.

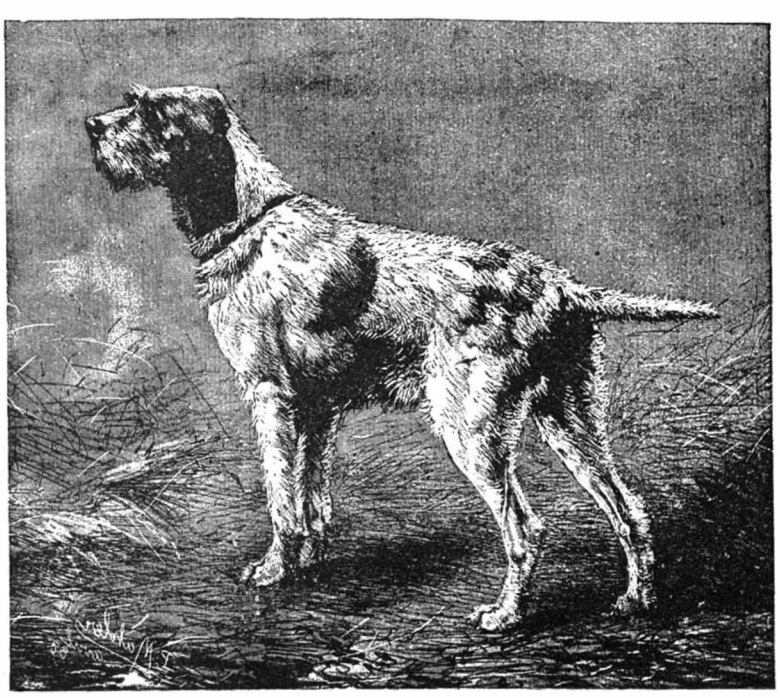
Is it becoming necessary for capital to combine, not against labor, but to compete successfully with other capital? Are small investors to be crowded out unless their interests are bound up in corporate organizations, and are the latter, unless unusually strong, to be mere satellites of the numerous pools, syndicates, trusts, etc., which have had such an influence on commerce, finance, and manufactures during the past few years? The tendency seems to be entirely in this direction, and on some accounts and to a very limited extent the policy is not a bad one. For example, we have trust companies which are as safe as laws and charters can make them, which pay a small regular interest on deposits and make their profit by loaning on mortgage or other security at higher rates, acting simply as agents when conservatively managed. Such institutions are a convenience in handling estates, bequests, annuities, and for small capitalists who, for the sake of greater security and the avoidance of worry about the choice of investments, are willing to accept reduced returns. The trust companies have also the advantage of being managed by expert financiers, whose judgment and opportunities are of course better than is usually the case with the smaller individual operators. Now a by no means new idea is being revived abroad in the shape of trust investment companies to deal mainly in mines and mining stocks. It is argued that subscribers will gain by the division of chances secured by spreading investments over a large number of ventures, and that what the companies lose in one direction will be made good by profits in others. The scheme is to advance money to float mining enterprises and to operate in the regular share markets. It is doubtful, however, whether it will work. Most similar trusts when applied to the mining industry have had a shady history, and no matter how respectable or at least well known the names of the managers may be, sad experience will render investors cautious in committing their money to the hands of mining trust investment concerns.—*Eng. and Min. Journal.*

Grain Bags.

The grain bag trade on the Pacific coast last year amounted to 33,000,000 bags, and the indications now are that 2,000,000 more will be required for the wheat crop this season. The prospect for a large wheat yield never was better. The entire bag capacity of the California Jute Mill Company is about 1,250,000 per year, and not more than this number can be produced by the double shift prison force at San Quentin. The great bulk of these goods, or over 30,000,000 bags, comes to the coast from Calcutta. They are filled with grain and shipped to Liverpool, and from there they are returned to New York as second hand bags, which can never again be used for wheat, but are used for bagging vegetables and mill offals.



PRINCE FRED—ENGLISH SETTER.



SACQUINE.

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The Magnesium Lamp.

According to the *Centralblatt fur Elektrotechnik*, the magnesium lamp invented by H. A. Gratzel, of Hanover, developed the following surprising results. Our authority says:

Since it has been found practicable to produce magnesium electrolytically on the large scale, and the price has consequently fallen within a few years to about one-fifth of its former amount, the attempt has been made to utilize the property of this metal (hitherto little regarded) of burning with great luster, in the construction of sources of intense light. There can be no doubt that with the increasing application of the magnesium light, the technical improvement of the lamps will proceed hand in hand. The burner here measured was made for experimental purposes only, but it yields a light burning with sufficient steadiness.

There can be burnt in this lamp as many as eight magnesium ribbons of 2·5 mm. in width and 0·13 mm. in thickness. It is, however, easy to burn any smaller number at pleasure. Even on burning a single ribbon there was no extinction, as it often happened with the earlier lamps. The strength of the light fluctuates more than in a well-regulated arc lamp, but the fluctuations are more gradual, so that they are perceptible only on the photometer screen, but not with the naked eye. They certainly occasion disturbance, and I have sought to eliminate their influence by increasing the number of observations. The greater the number of the ribbons burning, the smaller is the relative amount of these variations.

The white fume, in which state a part of the oxide formed during combustion escapes, found its exit through the ventilation shaft.

The escape pipe was firmly connected with a reflector attached to the lamp, so that the lamp could not be used without it. But as I wished to ascertain the strength of light which the lamp yields without reflector, it was pasted over with dead black paper. In this manner the strength of light for different numbers of ribbons could be conveniently determined. Lastly, as the concave mirror will be used with the lamp in many cases, the paper was removed, and after the polish of the reflector was restored, measurements were made with the reflector. These results of the latter, of course, hold good only for the lamp in question. The aperture of the parabolic reflector had the diameter of 39 centimeters. This is not the place to enter upon the details of the construction of the burner.

For determining the consumption of magnesium, the rolls upon which the supply of ribbon was coiled were weighed before and after the experiment, and the time during which the lamp was burning was accurately noted.

The strength of light was measured in the horizontal direction. A few determinations made at 33° (greater angles could not be used on account of the reflector) showed a decrease of the strength of the light of about 25 per cent.

Number of ribbons.	Strength of light in normal candles.		Without reflector.			Hourly consumption of ribbon per 100 candles.
	Without reflector.	With reflector.	Candles per ribbon.	Consumption of magnesium per hour ribbon.		
				Grammes.		Grammes.
1	150	3,200	150	16·7		11·14
2	237	5,880	118·7	16·7		14·10
4	450	8,000	112·5	16·7		14·80
6	700	11,300	117	16·7		14·15
8	950	17,000	119	16·7		14·03

The strength of light obtained per ribbon is therefore greatest when only one ribbon is burning. It sinks as soon as a second is introduced, but remains then approximately constant whether two or eight ribbons are in use. The somewhat abnormal result obtained with four ribbons is probably due to an experimental error.

The price of magnesium ribbon is at present 45s. per kilo. If the lamp burns with eight ribbons, it consumes hourly 134 grammes magnesium. If we disregard the first price of the lamp, it costs 6s. per hour burning, and 100 normal candles measured without reflector cost hourly $\frac{6s}{100}$ of 1s.

The lamp examined pushes forward hourly 32 meters of each ribbon. This speed appears to be too great, and can be decidedly reduced without reducing the strength of light of the lamp. Some of more recent construction push forward only 24 meters hourly. It appears also that the price of magnesium will shortly be reduced to 30s. per kilo. Hence an eight ribbon lamp would consume hourly 100 grammes of magnesium, at the price of 3s., and the hourly cost of 100 normal candles would be only $\frac{3s}{100}$s.

But even this price is still much too high to admit of the magnesium light competing with the electric light or with gas. The natural sphere of the magnesium light is different. It will be used wherever an intense light is demanded for a short time, and where gas piping and electric installations are not at hand. For such purposes magnesium is the cheapest source of light. The magnesium light is readily portable, and can be kindled at any moment by means of a match, and as quickly again extinguished.

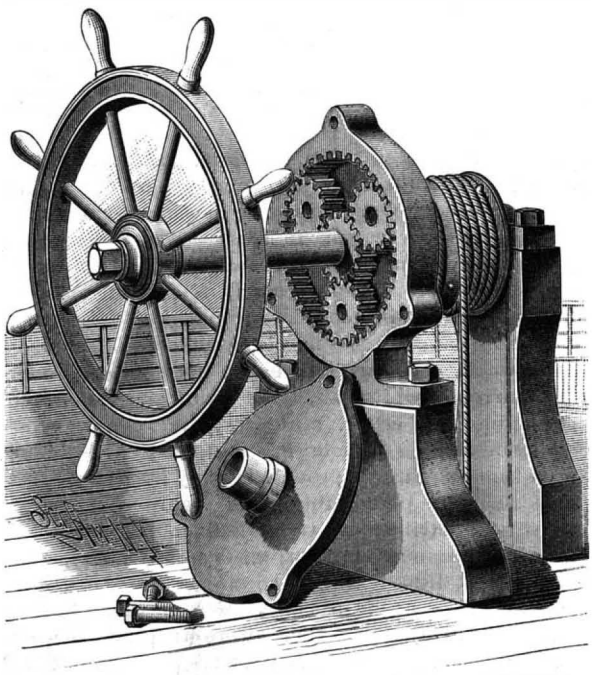
It is thus suited for military purposes, for luminous effects in theaters, in photography, in nightly building operations of short duration, in ships, etc.

Lamps have also been recently constructed arranged for burning several hours (during which the mechanism does not need to be wound up again), and the greatest intensity of light is thrown, not horizontally, but downward. Such burners are already in use for lighting up large halls, etc.

There is no need in electro-technics to fear the competition of the magnesium light, but one should rather seek to improve the preparation of this metal.

AN IMPROVED STEERING GEAR.

In the steering apparatus shown in the accompanying illustration, a drum has a flange at one end, which



SNELLING'S STEERING APPARATUS FOR VESSELS.

carries three or more studs, on which are gears meshing at the same time into the driving pinion on the shaft of the hand wheel and the internal gear in the standard or frame of the apparatus.

The proportions of these gears are such that the power applied to the hand wheel is greatly multiplied at the drum, so that it is only necessary to lead a single part of rope or chain direct to the tiller, obviating the necessity of the usual purchase blocks. The peculiar arrangement of gearing is calculated to give great strength to withstand the strains to which such machines are subjected.

Wheels meshed internally have more of their surface in contact than ordinary spur gearing, and, by the use of several stud gears (where one only is necessary to transmit the motion), this advantage is increased by dividing the strain on several parts of the internal gear, instead of applying it all in one place.

This invention is patented by Mr. J. H. Snelling, 158 South Street, New York, to whom application should be made for further information relative thereto.

To Identify Blood Stains.

Dr. Ferry (*Progress Medical*) advises that the fabric be teased out with a needle, and macerated in a solution 1:1000 of sodium chloride. The fluid will soon become tinged by the blood, and can be submitted to spectroscopic examination. To demonstrate the blood globules, add to some of the fluid a drop or two of a saturated solution of choral hydrate, which will throw down a rose colored precipitate. A drop of the precipitate is to be exposed on a thin plate over the flame of a spirit lamp, and the clear fluid which separates is to be removed by blotting paper. The pellicle of coagulum which remains is to be colored with fuchsin and washed with water. A drop of acetic acid will render the preparation transparent, and the globules will become visible in bright red.—*Pharm. Era.*

Exhibit of Edison Phonograph.

On the evening of May 12 the building of the Electric Club, on 22d Street, this city, was filled with a large number of members of the club and their friends, who had assembled to witness an exhibition of Mr. Edison's new phonograph. Several phonographs were placed in different rooms of the building, each with an attendant who illustrated the manner of working. In one of the rooms of the upper floor a compositor was setting type from the dictation of the phonograph. He received the matter through flexible ear tubes connected with the instrument, and started and stopped the phonograph, and caused it to repeat when necessary, by means of a pedal. In a similar manner, the words of the phonograph were written out by a type writer. In both cases the ear tubes were supported by a yoke passing over the head.

The president introduced Mr. E. T. Gilliland, of the Edison Phonograph Company, who read a brief paper on the development of the phonograph. He sketched rapidly the many improvements which have led to the perfected phonograph. He said that in justice to the inventor he must say that the credit of the phonograph belongs only to Mr. Edison, who was prevented from perfecting it sooner by reason of pressure of other business. Mr. Gilliland's paper was illustrated by lantern slides projected upon the screen. When Mr. Gilliland concluded, the president introduced Prof. Robert Spice, of the Polytechnic Institute, Brooklyn, who gave a short illustrated lecture on sound, with special reference to the phonograph. Among the experiments shown were Koenig's manometric flames, the sonometer, sympathetic forks, and the organ pipe. Prof. Spice's experiments were warmly applauded by the audience.

One of the phonographs then gave a cornet solo, which was loud enough to be heard anywhere in the lecture room. Mr. Edison occupied himself in exhibiting one of his phonographs to a group of friends.

Illustrations of the phonograph were given in our paper for December 31, 1887.

Poisonous Dyestuffs.

A recent occurrence in Lyons has confirmed MM. Arloing and Cazeneuve's conclusions respecting the poisonous character of some *aniline dyes* and the harmlessness of others. Almost an epidemic happened last November with female spoolers working a particular yellow cotton yarn used for gold lace making. Dr. Carry, of the Lyons Medical Society, who was the first to notice the accidents, on being called to attend a spooler, found the patient suffering from a complication of obscure complaints. The most apparent symptoms were weakness, dyspepsia, and vomitings, coupled with a bluish-gray coloration of the gums, extending to the inside of the lips. As the yarn on winding emitted considerable yellow dust, and other working girls were similarly affected, the physician was soon on the right scent. He found that, while the accidents were caused by the dye, some yellows were very poisonous, others less so, and some quite harmless. One sort, giving out much dust, was so dangerous that one working girl had lost, within a short time, two canaries and one cat. The bird's cage hung near her machine, and the cat had probably swallowed the deadly dust with her food.

Next it was found that in a shop, where many girls were employed, no accidents were noticed last summer while the windows could be kept open, but the trouble began in November and December, when they had to be closed. With the new patients Dr. Carry had full opportunity to observe all the symptoms. Besides those already mentioned, which mostly relate to the digestive functions, others pertaining to the nervous system were noticed, such as persistent cephalalgia, insomnia, and an analgesis of the skin so complete that pin pricks could not be felt. At the same time the circulation was normal, there was no fever, and no albuminuria.

Some twelve or fifteen women were under treatment for the same complaint, and the recovery was in all cases very slow. But the accidents were too evidently caused by some poison to be thus dismissed without further investigation. Lead, the first that suggested itself, was looked for by a Lyons pharmacist, but proved absent. Three different specimens of dust were next given for thorough analysis to a specialist—Professor Pouchot, of the Martiniere school—who confirmed the absence of lead, but found traces of antimony used as a mordant.

The first specimen, the most poisonous, was found to have been dyed with *sodium binitronaphthol*, generally known in trade as *Martin's yellow;* the second, less poisonous, with Poirier's light binitronaphthol; and the third, quite harmless, with sodic sulpho-conjugated binitronaphthol. Experiments on animals confirmed the chemist's report. Dr. Carry did not feel justified in concluding that goods thus dyed are dangerous to the wearers, but they are certainly to the weavers; and since yellows, equally good but harmless, can be obtained at a slightly higher cost, he thought the poisonous dyestuffs should be prohibited, or such ventilation enforced as to protect the working people from the dangerous dust.—*Therapeutic Gazette.*

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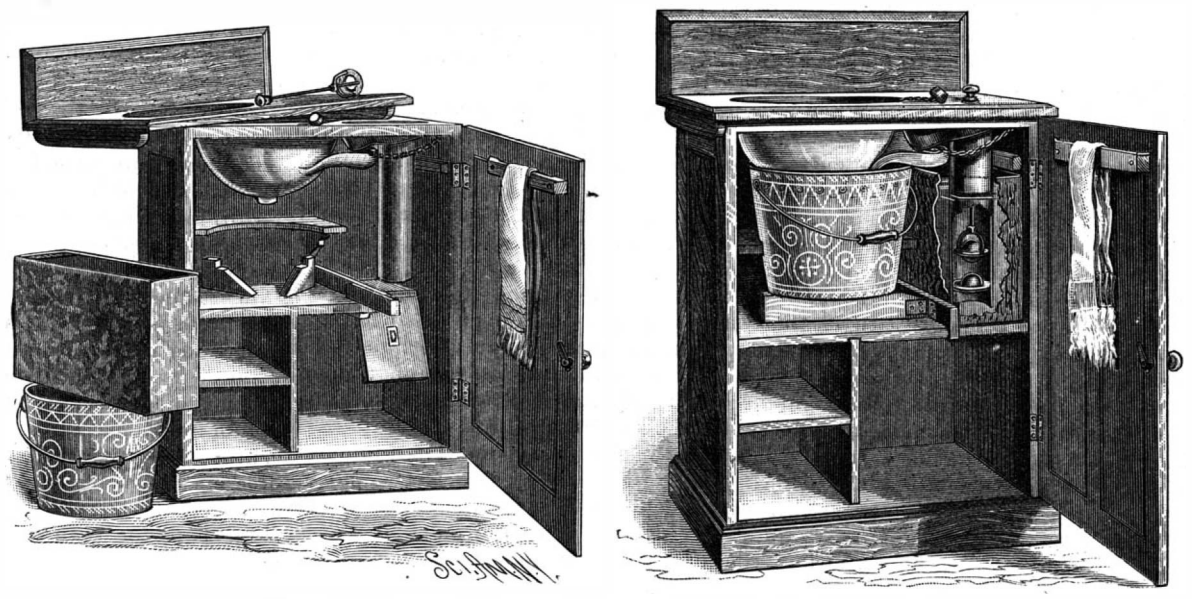
AN IMPROVED TOILET STAND.

In the patented toilet stand shown in the accompanying illustration, the fresh water is held in a reservoir beneath, and is pumped up and into the bowl over a projecting lip to the bowl beneath the slab. The pump is large, has no packing or closely fitting joints and the water is simply lifted in an easy, strong flow. The valves are rubber balls filled with shot and calculated to last many years, while they can readily and cheaply be replaced at any time. The fresh water reservoir is easily filled from time to time by simply pulling it forward, as a drawer, and replenishing from an ordinary nozzle spouted bucket. It can also be taken out entirely at any time to clean and air. The waste receptacle is an ordinary pail which sets up around and slightly above the lower portion of the bowl. Thus when full, or nearly full, it backs water up into the bowl and notifies the user. All danger of overflow, to which other such hidden sub-receptacles are incident, is thus avoided. The waste receptacle is securely held in place when in use, and is easily removed for emptying and cleansing by swinging open the little gate on which it rests in front and drawing it down and out. Every part of the stand is readily accessible and removable. The whole forms an extremely simple and economical arrangement, occupying but little space. The labor and breakage involved in lifting pitchers and bowls and spilling or splashing water into an exposed slop jar is avoided, and all the convenience and appearance of a stationary bowl is secured without the expense and the danger incident to the use of water and sewer pipe connections. This stand may be finished in any style and is susceptible of varied construction. For further information in regard thereto address Mr. H. C. Lowrie, Denver, Col.



A TOILET STAND FITTED WITH STATIONARY BOWL.

SPONTANEOUS MOTIONS OF BODIES ON THE SURFACE OF LIQUIDS.

Camphor, various odorous solids, and porous bodies saturated with volatile liquids, exhibit on the surface of water singular rotary and backward and forward motions, that attracted much attention from scientists during the first half of the present century. They have been attributed now to electricity, and now to simple mechanical phenomena of recoil, produced by the disengagement of vapors or fluid parts emanating from the substance and striking the air or water, but no definite solution, no clear and satisfactory explanation, of the phenomena has been given.

Dutrochet, the illustrious discoverer of endosmosis, after studies that were unfortunately vitiated by grave errors in the beginning (1841), but which were finally (1843) supported by experiments of a high value, found nothing to explain the movements under consideration but the hypothetical existence of an unknown force appearing at the surface of separation of any two liquids, and that he named epipolic force (from ἐπιπολῆ, a surface). This notion of a new force introduced into science was not accepted, yet, on the other hand, nothing was proposed as a substitute. To account for the movements of camphor, an effect of recoil, analogous to that of a skyrocket, was supposed, and yet this would not answer, for any one can see a very great disproportion between such cause of the motion and the motion itself.

Dutrochet guessed correctly when he conjectured that a special force must reside on the surface of liquids. To-day, in fact, it is everywhere recognized that such surface is the seat of a force which has been named superficial tension. As we shall need to know what this is, in order to understand what is to follow, we shall try to give a clear and simple idea of it.

Let us consider a soap bubble left to itself at the end of the tube that has served to inflate it. We see its volume rapidly diminish until it wholly disappears. At the opening, the air is expelled as if by an internal pressure, and produces an appreciable breath of wind. It is demonstrated in physics that the force that produces this pressure upon the air resides solely upon the free surfaces of the bubble, whether they be external or internal. These surfaces each act like a taut elastic membrane maintaining air under pressure. But it is not necessary to have a thin sheet of liquid with two free surfaces; a drop of water is, in fact, very much like a soap bubble, except that there is but one free surface, corresponding to the external surface of the bubble.

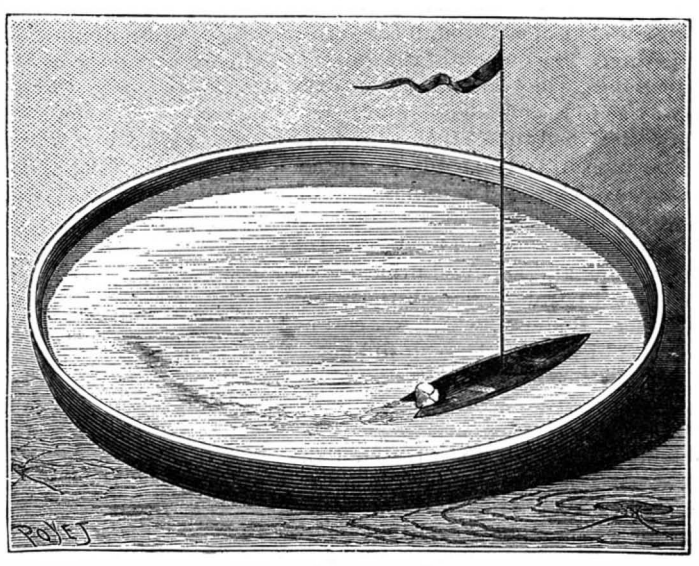


Fig. 1.—BOAT MOVED BY A FRAGMENT OF CAMPHOR.

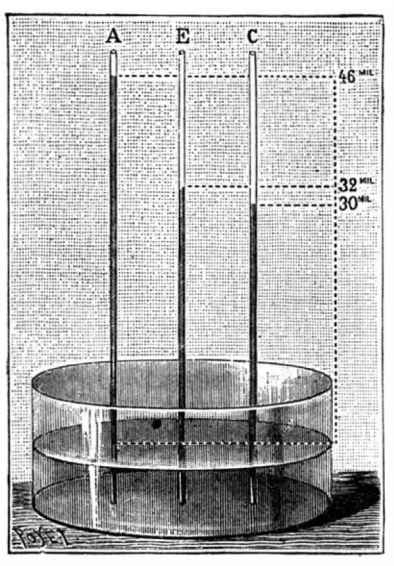


Fig. 2.
Levels to which water rises in a tube filled with air, A, vapors of ether, E, or vapors of camphor, C.

Finally, we might demonstrate that the free and plane surface of any liquid whatever is also the seat of a force that acts exactly as if the mass of liquid terminated in a very thin elastic and taut membrane. It has been found that it is to this force that are due the phenomena of capillarity, and perhaps many other less known ones. Let us say, even, to terminate these succinct notions, that this superficial tension of liquids is very probably only a peculiar case of attraction which is exerted between all bodies.

We know, then, that there constantly exists, at the surface of all liquids, a force that is at times powerful in its effects. But it is very remarkable that the intensity of this force changes with the nature of the liquid considered. We ascertain this by immersing the same capillary tube in various liquids, and observing the latter rise to different levels. It suffices, even, to pour a small quantity of any liquid upon water, to change the latter's superficial tension. This change is nearly always a diminution, on account of the very great tension of water at its surface, and which is greater than that of most liquids.

It was guided by these theoretical ideas that we were tempted to construct the little scientific toy shown in Fig. 1. It is a boat cut with scissors out of a thin sheet of tin, and hollowed out behind. When placed upon water, it readily floats. With a pipette, we place a drop of alcohol at the stern so as to touch the water, and we at once see the boat suddenly start off. At first sight, it really seems that a sudden and powerful repulsion occurs at the moment that the alcohol comes into contact with the water. But let us consider the facts from the standpoint of the tensions and tractions that the boat undergoes, when surrounded on every side by a liquid surface. In front, and at the sides, this surface is one of pure water, and, consequently, the seat of a strong tension. Behind, it is covered with alcohol, and this stratum, as thin as it is, renders the tension here notably less. Therefore, influenced by two contrary and unequal effects, the boat cedes to the more powerful, and is continuously carried along toward the free surface of the water.

There is, therefore, no need of invoking the existence of a repulsive force of unknown nature, for we know that there is an attractive force whose existence is certain, and which cannot remain without effect: the difference between a strong attraction, that of water, and a feeble one, that of alcohol. This fact is absolutely general. In fact, ether, chloroform, and oils produce a more or less rapid motion of the boat. Theoretically, most liquids might serve, on account of the strong tension residing on the surface of the water.

It might, doubtless, be thought that these effects occur only with quite a thick stratum of liquid on the water; but it is easy to demonstrate the contrary. An extremely tenuous stratum suffices to produce marked effects. Even vapors show these, and it is only necessary to suck air charged with them from bottles by means of a capillary tube and then insert the tube in water to see the level of the latter therein completely changed—lowered to a considerable degree (Fig. 2). Let us note

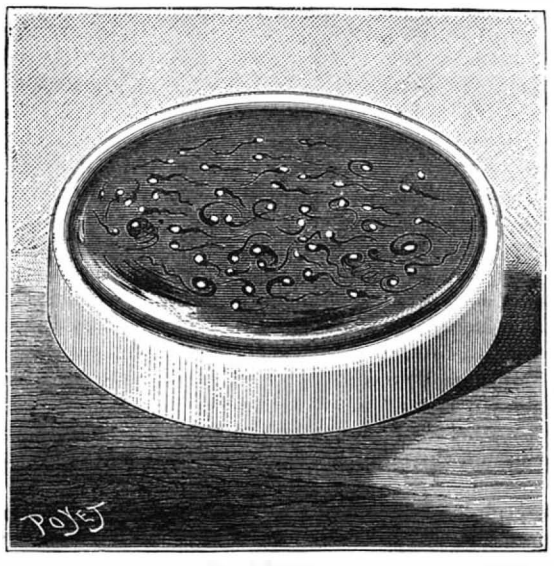


Fig. 3.—MOTIONS OF CAMPHOR ON THE SURFACE OF MERCURY.

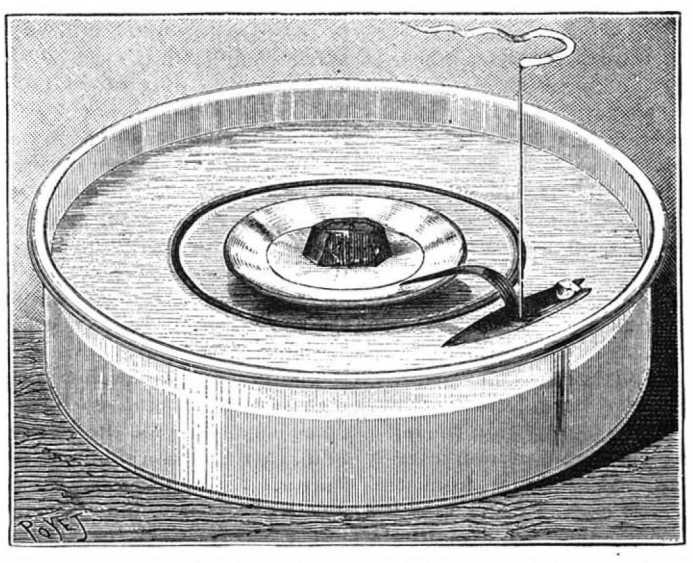


Fig. 4.—TIN BOAT CAUSING A LOADED FLOAT TO REVOLVE ON WATER.

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here that the effect is produced perfectly with the vapors of camphor, so that we should suppose that this body ought to set the boat in motion just as the preceding liquids did. This, at least, is what *we* thought, and the experiment really exceeded our anticipations, for the boat was not only set in motion, but kept up a regular and rapid movement for a long time—for entire hours. We recommend it to experimenters. It is very easily tried. It is rendered very visible to spectators by fixing a mast (glass or straw) to the center of the boat by means of sealing wax and fastening a flag to the summit.

By these experiments the cause of the motion of camphor and other bodies on the surface of water is explained without difficulty. It is always a difference of unequal superficial tensions that produces the motions. The thing is equally true with mercury, upon which, as we know, camphor moves as it does upon water. *Apropos* of this subject of experiment, we think we ought to say here that it is not necessary, as recommended by Messrs. Joly and Boisgiraud, to redistill and purify the mercury that is to be used. We have had constant success with the experiment by simply sucking up the mercury in a pipette (so as to avoid the impurities of the surface), and dropping it into a cup placed upon a plate. If need be, we pass a very clean strip of glass over the edge of the cup, so as to scrape off the surface of the metal. Upon afterward sprinkling a few granules of camphor over the mercury and forming a mist with the breath, we observe a multitude of what look like long-tailed tadpoles of extreme agility moving over the surface. This experiment is most curious, and very easy to perform (Fig. 3).

For mercury, as for water, it might be demonstrated that the motion is indeed due to a difference of superficial tensions. We have, moreover, a demonstrative experiment to this effect. It suffices to blow gently and continuously, from the side, over the surface of the mercury, to see the "tadpoles" move in a crowd against the wind and assemble on the convex edge of the metal nearest the observer. These motions are at the same time more lively, especially when the precaution is taken to heat the mercury slightly. The same thing is observed with naphthaline.

We have succeeded with the same experiment on water, although success is not so certain, on account of secondary influences that we cannot detail. This time it is by means of burning flowers of sulphur floating upon the liquid. The motions are capricious and analogous to those of camphor. When we blow in a contrary direction the flame is urged, and we have often seen a fragment move against a strong current of air and apply itself to the edge of the plate. The observation is here particularly startling, for the wind produced carries along swiftly all the other floating particles.

In these two experiments it is scarcely possible to invoke a reaction produced upon the air, unless we gratuitously assimilate each fragment to one of those flying skyrockets that always rise against the wind. On the contrary, with the idea of superficial tensions, we see that the breath has exactly the effect of directing the emitted vapors in such a way as to force the fragment to move against the current of air. It renders the surface in front free, and encumbers it in the rear.

We now know the cause of the motions of the camphor, but we as yet know nothing as to the mechanism of their stoppage. It results, however, from Messrs. Joly and Boisgiraud's experiments, that this occurs every time that a greasy pellicle, even a very thin one, exists upon the surface of the water. It seems very natural, then, to attribute the stoppage to a diminution of the superficial tension. An experiment analogous to another already made with a thin soapy film is demonstrative as regards this. Lay a ring formed of flexible waxed wire upon the surface of very pure water. It is irregular in its contour, but it is only necessary to place a drop of oil within it to see it immediately bend into a nearly perfect circle that confines the oil within its circumference. When placed outside, the oil produces the opposite effect, contracting the ring into folds as close as the flexibility of the wire permits. These effects are explainable on the assumption that the wire is in both cases attracted toward the surface which is free and which has retained all its force. This consequently demonstrates to us that the oil lowers the tension at the surface of the water. But there is another factor to be considered, and that is viscosity. This is so great here that we see the oily stratum move in a body along with the ring. In order to separate the viscosity and the diminution of superficial tension, it occurred to us to connect two boats, one of them placed upon an oily surface and the other upon a pure one, by means of a rigid bridge. A floating ring of waxed brass wire is first laid upon the pure water and the bridge is placed astride it. A fragment of camphor, being placed behind the external boat, puts the whole in motion. We then put a drop of oil within the inner circle, and observe that the continuous motion scarcely slackens. Yet we observe that, starting from this moment, the ring is manifestly carried along. So the viscosity of the oil does not suffice to explain the stoppage of the camphor's motion. It is, therefore, the change of superficial tension that is the sole important factor. We already see that the theory of a reaction (produced this time upon the liquid or the air) is very poor in argument; but that is not all. We place upon the water, be it oiled or not, a large float in the form of a watch crystal, and put the neighboring boat at the side of it, and the motion continues, although it necessarily slackens. Upon the float, we place a bottle or any object whatever weighing anywhere from two ounces to two pounds, and the motion ever continues. It is in vain to arrest it; it quickly begins again (Fig. 4).

When we reflect upon the friction overcome and the mass carried along, we have to recognize the fact that the current produced by the emission of less than twelve one-hundred-thousandths of a cubic inch of air in one minute is incapable of such effects, for it would be necessary to attribute to these particles a sudden velocity of about forty miles per second.

From these experiments, as a whole, and from several others that we have had to pass over in silence, for want of space, we think that we can assert that the cause of the mysterious motions of camphor upon water and mercury is definitely ascertained, and is due to the effects of a known and measurable force.

In a communication which produced a profound sensation last year at the Academy of Sciences and in the scientific and commercial world, Admiral Cloue raised a question very similar to the one under consideration—that of the action of oil upon the waves of the ocean. The study that we have just made will perhaps allow us to approach one side of the problem that has hitherto been neglected. And certainly we believe that if a few laboratory experiments could throw light upon the solution of a question upon which depends so many human lives, those who are continuously asking science for practical applications would have reason to declare themselves satisfied.—*H. Devaux, in La Nature.*

New Guns for the U. S. Navy.

The new 53 ton gun which has recently been completed at the South Boston Iron Works has been loaded on the deck of a schooner, and is to be transported directly to Sandy Hook, where it is to be tested under government supervision. This gun is of the French type, and is a 12 inch breech-loading cast iron rifle, hooped and tubed with steel. The casting, when taken out of the pit, weighed 90 tons, which has been reduced to its present gross weight of 53 through the shrinkage in turning and boring. The outside of the gun is made of 27 wrought steel rings, which are shrunk on, overlapping in such a way as to re-enforce one another. The bore is provided with a steel tube 5 inches thick, which is inserted at the breech and extends as far as the trunnions, a distance of 14 feet. The gun is 30 feet long. The trial to which the gun is to be subjected at Sandy Hook is a very severe one. The standard of the trial is 500 rounds, using an 800 pound projectile and a charge of 265 pounds of powder. This is the same test to which the American Rodman, which was cast at the same foundry, was subjected, and which did not come up to the standard, as the erosion became so great that further testing was discontinued after the 137th round. It is hoped that the steel tube in the bore of the new gun will enable it to resist the wear, and that it may be able to stand the severe requirements of the Ordnance Bureau.

The Rodman gun is being held at Sandy Hook awaiting the result of the experiment of the new gun, and in case the trial is satisfactory it may be possible, with the knowledge now to be had concerning the practicability of inserting a steel tube in a cast iron gun, that the Rodman gun may be rebored and provided with a steel core, as in the case of the French gun.

The South Boston Iron Works have also in course of completion a new gun of the Italian type, which is to be subjected to the same government test. This is the gun which met with an accident while being cast in 1884. While the metal was being run into the mould the flask broke and the liquid metal vomited out through the top of the mould, causing considerable loss and delay. This event was commented upon and illustrated in the SCIENTIFIC AMERICAN of July 26, 1884. When completed, the gun will weigh 54 tons.

The last casting, which has been most satisfactory, has been successfully bored, and is now ready to receive the steel tube which is to be inserted at its breech. This tube is 14 ft. long and 5 in. thick. The gun has not yet been rifled.

Perhaps the most important ordnance work, however, that is being conducted is the construction of two "built-up" steel rifles. These are all steel and have an eight inch bore. These guns are of a different type from any that have been constructed here, and their success or failure will have much to do in determining the future of gun making in this country. Two eight inch pneumatic gun carriages for naval use are also being constructed at these extensive works, as also four 10 in. carriages of a similar type for use on the monitor Terror.

One of the new ten-inch steel breech-loading rifles has recently been tested at Annapolis. This gun was designed for the ironclad Miantonomoh, and was tested after being mounted on its hydraulic turret carriage. The gun was handled with great apparent ease and performed quite as good service after as before the trial.

This gun is the first of the ten-inch rifles for the ironclad monitors. It is 27 ft. 6 in. long and weighs 58,000 pounds, exclusive of its carriage. It fires a charge of 250 pounds of cocoa powder and a steel armor-piercing sheel weighing 500 pounds. It gives a muzzle energy of from twenty-four to twenty-five thousand government tons.

Opium Cultivation in Persia.

Opium occupies the first place in the foreign trade of Persia. It insures the largest and most direct cash return to the producer, and, as a natural consequence, the area under cultivation is increasing greatly. The two principal markets are Hong Kong and London. In 1886, 4,993 chests, worth 374,475*l.*, were exported from the ports in the Persian Gulf, exclusive of what was sent away by land routes or was consumed in the country itself. The quantity of morphia contained in Persian opium is 11½ to 12 per cent, while in other opium producing countries it rarely exceeds 9½ per cent. *Papaver somniferum,* or white poppy, of which opium is the inspissated juice, is grown principally in and about Ispahan, Yezd, and Shiraz, that of Ispahan being superior both in quality and quantity. The preparation of the land begins about September 5, and consists in plowing, harrowing, fertilizing abundantly with ashes and detritus, and laying off into squares to facilitate irrigation. After sowing, the fields are irrigated three times, at intervals of fifteen days. After that there is only one more irrigation—about the middle of the winter. In the spring, irrigation takes place on March 20, after which the land is repeatedly harrowed and hoed in order to extirpate all parasitic weeds. The plants are thinned, and then watered every ten days until flowering begins, when all work must cease. When the heads have formed and have fully ripened, a last flooding is given. Then six slight incisions are made at about the junction of the stem with the head. This should be done at noon. The juice that exudes is collected the next morning and the morning following at daybreak. When these first incisions have ceased discharging, others are made lower down, and the operation may be thus thrice repeated, the opium obtained after each successive incision being proportionately inferior quality. Next, the plants themselves are cut down and the heads sold, the natives using the seed on bread as a substitute for butter. The end of May is the season for harvesting. —*Chemist and Druggist.*

Electricity in Place of Horses.

The Fourth Avenue street railway cars are soon to be propelled by electric motors propelled by storage batteries carried on the cars. About one-fourth of the building of the 85th Street stables has been appropriated to the operations of the Julien company, and there are masons and machinists at work on the ground floor putting up steam boilers and machinery. There are also draughtsmen and designers in the second story, all earnestly engaged upon the plans that are intended soon to banish horses and confine steam to the work of turning a dynamo. The dynamo itself is already at work, and two long tables on the ground floor are covered with accumulators undergoing the charging process. The exhibition car which has been seen upon the road during many months past has been taking a rest recently while workmen were engaged in making alterations to lighten it and improve its running qualities. It has been much improved. The first ten cars have been ordered and are expected to be ready soon. The capacity of the charging room, now in preparation at 84th Street, will be equal to the supply of accumulators for twenty cars. If the performance of this number of cars is found satisfactory after they have been equipped, the main stables on Fourth Avenue will be taken for the location of the dynamos as the more central and convenient point.—*New York Sun.*

Curious Case of Deafness.

Some time ago, says the Columbus *Journal*, an engine driver on the Little Miami Railroad was suspended because, after having been examined by Dr. Clark, he was found to be quite deaf. The engineer claimed at the time that he could hear everything while running his engine; but the doctor found that in a still room he could not hear ordinary conversation a foot away. The engineer lives at Cincinnati, and received treatment in that city for his disease, but without any special benefit. After being suspended eight months the engineer again came to Dr. Clark and insisted that he could hear perfectly while on a moving engine. The doctor thought he would test the case, and, accompanying the man to Cincinnati, made a number of experiments with him on engines. The result was that the doctor found the engineer was not only telling the truth in regard to the matter, but also that the deaf man could hear low remarks and whispers on a moving engine that even Dr. Clark's keen ear failed to catch. The engineer was reinstated in his former place.

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ENGINEERING INVENTIONS.

A car door has been patented by Mr. Thomas G. Ruffhead, of Renovo, Pa. This invention has special reference to mounting or hanging the door, and is designed to maintain a close joint between the door and car, however much the latter may be warped or sprung out of shape.

A wicket dam has been patented by Messrs. Benjamin F. and John C. Thomas, of Louisa, Ky. The dam is pivoted on a hinged post and supported by a prop abutting on a heurter of special construction, whereby the dam can be easily raised and placed in position or lowered to discharge the accumulated waters.

A car coupling has been patented by Mr. Thomas Gaskins, of Arcadia, Fla. The coupling hooks have their front faces curved upwardly and pivoted to work vertically, in combination with horizontal bolts, a shoulder of support in front of the bolts for holding the hooks up, suitable drawheads, and other novel features.

A weighing scale for railway cars has been patented by Mr. Elonild Duplessis, of Lake Weedon, Quebec, Canada. This invention provides means whereby a railway ca. can be weighed at any point on the track, and with equal facility when the car is not standing level, the weight being taken at the four points of support.

A compound rail has been patented by Mr. Edward G. Chamberlain, of San Jose, Costa Rica, Central America. It has a central bar with flanged base and side reversible bars bolted thereto, having their lower edges resting entirely on top of the flanges of the central bar, the central and side bars having their upper edges even to form the tread of the compound rail.

AGRICULTURAL INVENTION.

A sheaf carrier for grain harvesters has been patented by Mr. William Bell, of Morden, Manitoba, Canada. It is made with a fork-shaped support or table to hold the sheaves delivered to it from the binding table, so that it may be conveniently operated by the harvester for dumping the sheaves to the ground, thereby preventing waste and saving time and labor.

MISCELLANEOUS INVENTIONS.

A fruit drier has been patented by Mr. Zacheus W. Merithew, of Grand View, Ind. It is intended especially for open-air drying, and provides a simple construction for ample scaffold room in good drying weather, and perfect inclosure by means of the scaffolding in bad weather.

A heating drum has been patented by Mr. Walter Markle, of Tonganoxie, Kansas. It is designed to utilize waste heat from below to heat upper apartments, and provides certain improvements whereby air may be drawn from the heated room without admitting smoke or gas.

A combined wardrobe, bureau, and washstand has been patented Mr. Henry F. Wulff, of San Antonio, Texas. This invention covers a novel construction and arrangement of parts in an article of household furniture designed to be substantial, inexpensive, and very conveniently arranged.

A hoisting machine has been patented by Mr. Fridrich H. A. Peters, of Detroit, Mich. An endless rope is employed for operating the hoisting wheel, which is so constructed that the rope will be prevented from slipping, and will also take a hold upon the wheel to assist in hoisting.

A cider mill has been patented by Mr. Charles W. Boyle, of Bradley, Mich. It has pressing rollers journaled on a frame, with an endless belt passed between the rollers and bed rollers inclined toward one end, to facilitate discharge of the juice, the invention covering various novel features.

A sleigh knee has been patented by Messrs. Herman and Henry Wesle, of Medford, Wis. Combined with the runner and the beam is a cylindrically convex casting secured to the beam, with proper bearing plates, being designed to allow the runner to conform to inequalities of surface over which it passes.

A shell fish refrigerator has been patented by Mr. Henry C. Constantin, of Brooklyn, N. Y. This invention provides a receptacle for clams and oysters in the shell for restaurants, lunch rooms, etc., where they may be kept at an even, cool temperature, and readily withdrawn without opening the doors of the receptacle.

A combined slate and ruler has been patented by Louise M. Dyer, of Yazoo City, Miss. The frame has longitudinally and transversely ranging grooves, and a ruler fitted in the grooves at each side of the slate, these rulers being arranged with pencil guiding slots ranging lengthwise and crosswise of the slate.

A metallic mould has been patented by Mr. Philip F. Dillon, of Savannah, Ga. It is intended for casting metals and permitting of the shrinkage of the casting without subjecting it to strain, having a contractile core and contractile cope to permit of the shrinkage of the casting in the mould without danger of straining or cracking it.

A secondary battery has been patented by Mr. Ludwig Epstein, of Martinikenfelde, near Berlin, Germany. This invention covers a method of preparing powdered lead for electrodes, consisting in adding sulphate of lead to molten metallic lead and stirring the liquid mass until it has been transformed into a finely divided powder, with other novel features.

A baling press has been patented by Mr. William A. Laidlaw, of Cherokee, Kansas. The plunger has a slot fitted to receive a rope, combined with a shaft and a spring for giving it a rotary tendency, the rope secured to the shaft having a number of knots whereby its connection with the plunger may be adjusted, thus making a press whose plunger rebounds or springs back after each pressing impulse.

A prop for top buggies has been patented by Mr. Isaac Bateman, of Fern, Pa. It is made of a volute-shaped spring, having a square socket formed on its inner and lower end and curved spring arms on its outer and upper end, the whole being constructed integrally, the volute spring being made thinner in its lower portion than the upper portion, to render it more elastic.

An ice creeper has been patented by Mr. Charles J. Lung, of Jamestown, N. Y. It has a metallic plate with spurs projecting from its under side, a toe strap secured to the front edge of the plate and metal clips secured to its rear corners, in connection with an elastic heel or back strap having rings through which the clips pass and by which the band is secured to the plate, the device being readily applied or removed without soiling the hands.

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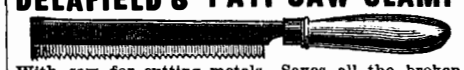

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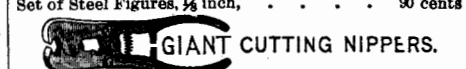

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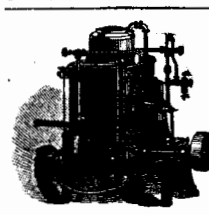

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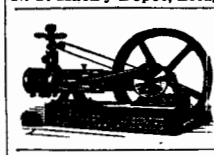

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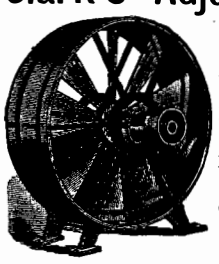

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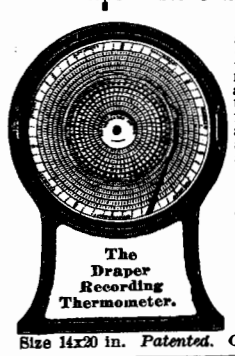

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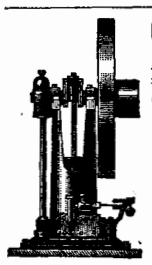

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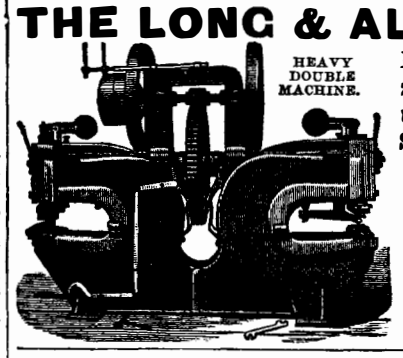
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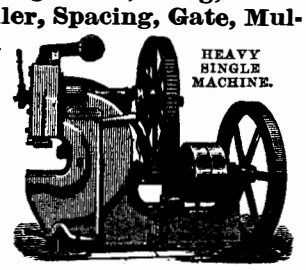
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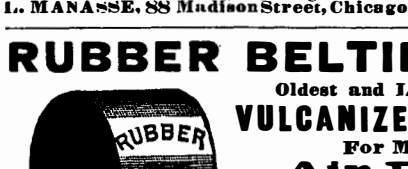

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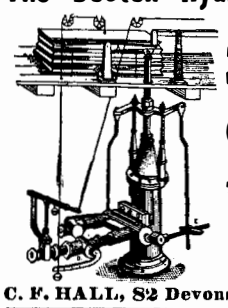

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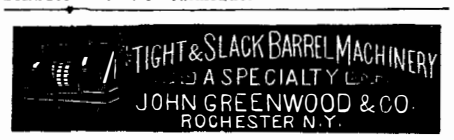

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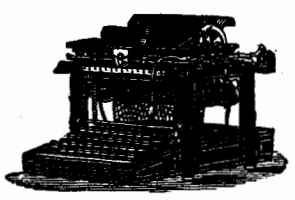

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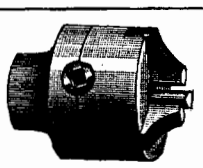

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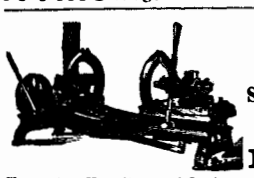

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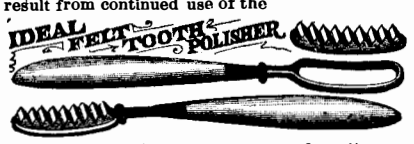

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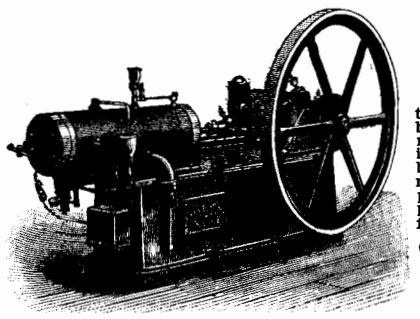

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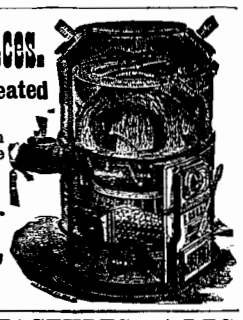

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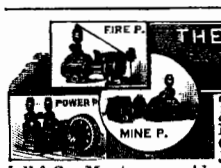

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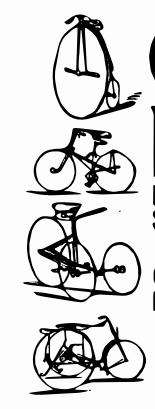

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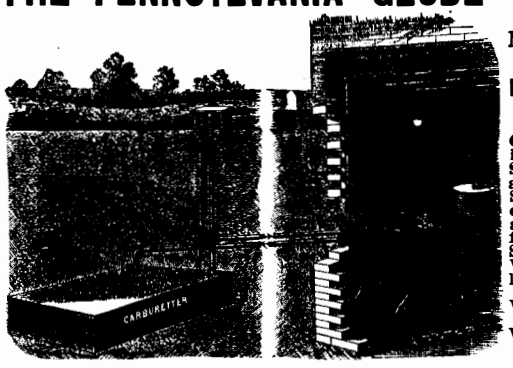

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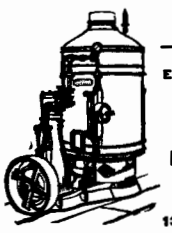

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